FLY ME TO THE MOON: THE PRESIDENT'S SCIENCE ADVISERS AND THE

POLITICIZATION OF SPACE EXPLORATION

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LIST OF ABBREVIATIONS

Main text

ARPA	Advanced Research Projects Agency
DOD	Department of Defense
EOR	Earth Orbit Rendezvous
LOR	Lunar Orbit Rendezvous
NACA	National Advisory Committee for Aeronautics
NASA	National Aeronautics and Space Administration
NSC	National Security Council
ODM-SAC	Office of Defense Mobilization's Science Advisory Committee
PSAC	President's Science Advisory Committee

Footnotes

DDE	Dwight D. Eisenhower
JFK	John F. Kennedy
JFKPL	John F. Kennedy Presidential Library, Boston
NYT	New York Times
OST	Office of Science and Technology
RIAS	Roosevelt Institute for American Studies, Middelburg

OVERVIEW OF SCIENCE ADVISERS

Dwight D. Eisenhower	1957-1959	James R. Killian
	1959-1961	George Kistiakowsky
John F. Kennedy	1961-1963	Jerome B. Wiesner
Lyndon B. Johnson	1964-1969	Donald F. Hornig
Richard Nixon	1969-1970	Lee A. DuBridge
	1970-1973	Edgar E. David

INTRODUCTION

> "But why, some say, the moon? Why choose this as our goal? And they may well ask why climb the highest mountain? Why, 35 years ago, fly the Atlantic? […] We choose to go to the moon in this decade and do the other things, not because they are easy, but because they are hard."
>
> John F. Kennedy, 1962[1]

More than fifty years after Apollo 11 successfully returned to earth, the moon landing can still be considered one of the most memorable technological achievements of mankind. Yet President Kennedy's decision to go to the moon was not made for technological reasons but should be viewed in the political context of the Cold War. Reflected by the quote above from Kennedy's famous speech at Rice University in Texas, a manned moon landing was well suited for emphasizing American exceptionalism because it would show the rest of the world that the United States was the only country that had the money, skills, and willpower to do something so difficult. As Kennedy would emphasize later in his speech, a crucial element of the moon landing was beating the Soviet Union to it. He understood that when Neil Armstrong would make his first step, people across the world would be glued to their television sets and radios to witness American astronauts planting an American flag. The moon landing was a remarkable technological achievement, but it was also the perfect Cold War propaganda.

Kennedy's decision to accelerate NASA's Apollo program and put a man on the moon before the end of the decade, formally announced about one year before his Rice University speech, was not made lightly. One of the bodies that he consulted was the President's Science Advisory Committee (PSAC). The committee, brought to life by President Dwight Eisenhower in 1957, consisted of prominent scientists who were able to assist the president in

[1] John F. Kennedy, "Address at Rice University," 12 September 1962, Houston, Texas, from the John F. Kennedy Presidential Library Archives, https://www.jfklibrary.org/asset-viewer/archives/JFKPOF/040/JFKPOF-040-001, p. 4.

formulating policies regarding any scientific subject. The direct cause for the establishment of PSAC was the successful launch of Soviet satellite Sputnik, and so one of the major themes that occupied these scientists was formulating a fitting American space policy.

The possibility of a manned moon landing had been discussed since the formation of the committee, and PSAC had consistently advised against it. The scientists recommended focusing on satellites as they had many promising scientific applications, such as weather prediction, communication, and measurements of the atmosphere. Even if one were to undertake a moon landing, sending a human being would – scientifically speaking – not have any added value over sending a robot. Overall, they argued, the money and effort needed to bring a man to the moon would not be worth the limited scientific opportunities it would yield.[2]

Although Kennedy took PSAC's advice into careful consideration, he evaluated the need for a manned moon landing on political terms, not on scientific ones. He did not want to carry out the program for the maximization of scientific insights but the maximization of world prestige. PSAC members, however, were primarily scientists, and although some of them also held board positions within their university or company they were not used to thinking in political terms. The committee was used to found its advice on scientific grounds and tried to come across as objective as possible. With Kennedy's politicization of space exploration, however, PSAC found itself in a situation where science and politics were inextricably linked. The committee thus needed to adapt to the fact that their scientific advice would carry political connotations, too.[3]

[2] John F. Kennedy, "Special Message to Congress on Urgent National Needs," 25 May 1961, Washington D.C., from the John F. Kennedy Presidential Library Archives, https://www.jfklibrary.org/asset-viewer/archives/JFKPOF/034/JFKPOF-034-030; President's Science Advisory Committee, "Introduction to Outer Space," March 26, 1958, Appendix to James R. Killian, *Sputnik, Scientists, and Eisenhower*.

[3] Zuoyue Wang, *In Sputnik's Shadow: The President's Science Advisory Committee and Cold War America* (New Brunswick: Rutgers University Press, 2008), 219-223.

This thesis aims to show how the politicization of space exploration changed PSAC's influence. To do so, this thesis first assesses the committee's work under President Eisenhower to show that PSAC's influence on space policy was determined by three factors: the political relevance of advice, the science adviser's political tact, and the president's receptiveness towards advice. Then, this thesis describes how these three factors change during the Kennedy and Johnson administration. Because Kennedy's decision to land a man on the moon marked a sharp change in space policy since the formation of PSAC, it is possible to compare the committee's advice and influence on the president before and after this moment, to conclude how these scientists were affected by the politics surrounding the Apollo program. Lastly, this thesis looks at PSAC's reaction to the politicization of space exploration and the committee's changing influence, and whether these reactions proved effective.

Scientists are generally expected to be objective and apolitical; scientists' participation in a political environment as described above can taint their image, leading to distrust. Scientists are increasingly "perceived as hired brains of special interests and lobbyists for their own," Susan Cozzens and Edward Woodhouse write. Scholars in the field of science, technology, and the state have been working to deconstruct this dichotomy of the 'pure scientist' versus the 'tainted scientist', arguing that objective scientific research does not exist: scientists are influenced by the society they live in, making scientific research inherently political. Acknowledging and analyzing the intertwining of politics and science provides a better understanding of how one affects the other and can take away from the increasing distrust in science. This thesis aims to strengthen that understanding by analyzing

PSAC, as the establishment of this committee marked the beginning of institutionalized cooperation between scientists and the president during peacetime.[4]

Few scholars specifically focus on PSAC, but in the fifty years since Neil Armstrong set foot on the moon a lot has been written about the Apollo program. This includes many works that outline PSAC's role in shaping space policy, which makes for a clear idea of how the committee has contributed to the process of putting a man on the moon. Because either the president or NASA is at the center of such analyses, however, such works only mention PSAC's output and thus depict the committee's advice as a one-way street, rather than an iterative process that includes how PSAC is influenced by the political environment it was in. This thesis aims to add to the current literature on PSAC by providing a better understanding of what shaped the committee's degree of influence in the White House and how its members responded to a change in their influence.

This thesis approaches the topic from the discipline of history and is a close reading of both secondary and primary sources. Within the topic of this thesis, multiple areas within the discipline of history overlap, such as presidential history, the Cold War, and the history of science. Secondary sources therefore broadly fall into these three categories: first, presidential biographies, literature on the coming about of space policies, and presidential science advising; second, literature on the space race; and last literature on NASA and the technological process behind the Apollo program. Primary sources include documents from the Eisenhower, Kennedy and Johnson administration, many of which are from the Roosevelt Institute for American Studies (RIAS) in Middelburg and the John F. Kennedy Presidential Library in Boston, and include records of National Security Council meetings and Cabinet meetings attended by PSAC members, correspondence between PSAC members and the

[4] Susan E. Cozzens and Edward J. Woodhouse, "Science, Government, and the Politics of Knowledge," in *Handbook of Science and Technology Studies*, ed. by Sheila Jasanoff, Gerald E. Markle, James C. Peterson & Trevor Pinch (Thousand Oakes: SAGE Publications, 1995), 533-34.

president, and other documents concerning the president's space policy such as correspondence with the NASA administration. Other primary sources include articles or autobiographies from PSAC members and contemporary articles from the New York Times.

This thesis is limited in focus and scope. First, this thesis only focusses on space policy, specifically the Apollo program, to draw conclusions on PSAC's influence in the White House. Because Kennedy drastically changed his space policy, this topic makes for a good analysis of PSAC's changing influence and adaption to a political environment. Space policy was one of PSAC's main areas of advice and therefore can reflect larger themes such as PSAC's relationship with the president and the science adviser's skills in the White House. PSAC advised the president on many more topics, however, and the conclusions drawn in this thesis might not reflect the committee's influence in other areas. This thesis also covers a limited period, from the foundation of PSAC under President Eisenhower in 1957 up until the end of Johnson's presidency in January 1969. Although the moon landing occurred half a year later during Nixon's presidency, the majority of the work done on the Apollo program as well as PSAC's role in the enterprise took place before Nixon entered the White House. Furthermore, the scope of this thesis is far too limited to analyze the vast number of sources available on PSAC during this period. This thesis is therefore limited in its focus, both on the people within PSAC as well as people outside of PSAC. Within PSAC, this thesis focusses mainly on the chairman of PSAC, who also bears the official title of Science Advisor to the President and therefore had direct contact with the president. Outside of PSAC, this thesis mainly focuses on presidents Eisenhower, Kennedy, and Johnson, as they largely shaped the political environment of the White House and because PSAC reported directly to the president. Although less frequent, this thesis also considers the role of James E. Webb, who was the director of NASA during the Kennedy and most of the Johnson presidency.

All in all, the costs for putting a man on the moon turned out to be $24.5 billion, which would have been $151 billion in 2010. In comparison, the Manhattan project was 28 billion and the Panama Canal 8 billion in 2010 dollars.[5] It might have resulted in the technological highlight of the twentieth century, but if it had been up to Kennedy's science adviser, the money would have been spent otherwise. When discussing the costs of a potential manned moon landing, the science adviser wrote: "I do not know a scientist who would support even the present level of space exploration … solely for the scientific goals."[6] As this thesis will show, sometimes this scientific outlook was welcomed in the White House, but at other times it was strongly rejected.

[5] Logsdon, John M. "John F. Kennedy's Space Legacy and Its Lessons for Today." *Issues in Science and Technology* 27, no. 3 (2011): 29.

[6] Jerome B. Wiesner, letter to Theodore Sorensen, December 19 1960. In *Jerry Wiesner: Scientist, Statesman, Humanist: Memories and Memoirs*, ed. by Walter A. Rosenblith (Cambridge, MA: MIT Press, 2003), 459.

CHAPTER ONE

Historiography: Science and the State in the Early Cold War

"Science is built up with facts, as a house is built of stones," the famous mathematician Henri Poincaré wrote. Because of this facts-based approach science has the appearance of being apolitical, but towards the end of the Cold War historians of science have come to agree that science is very much related to politics. In the words of Susan Cozzens and Edward Woodhouse, the conception arose that "scientific knowledge is not the passive product of nature but an actively negotiated, social product of human inquiry."[1] Although politics "has been a part of scholarly life since at least the age of Plato's Academy," as David Kaiser writes, the relationship between science and politics has played an especially important role in the twentieth century.[2] The Manhattan Project to develop the atomic bomb, for example, has become a symbol of science and politics coming together: the state directly worked with prominent scientists to turn scientific knowledge into military and political power. Although the atomic bomb ended the war, rising tensions with the Soviet Union ensured that the state remained interested in maintaining close ties to the scientific community to enhance national security. World War II, therefore, became "a watershed, restructuring the relationship between science and government," Naomi Oreskes writes. In this new relationship, government organizations became the largest funders of scientific research – in physics research, for example, the Department of Defense and the Atomic Energy

[1] Susan E. Cozzens and Edward J. Woodhouse, "Science, Government, and the Politics of Knowledge," in *Handbook of Science and Technology Studies*, ed. by Sheila Jasanoff, Gerald E. Markle, James C. Peterson & Trevor Pinch (Thousand Oaks: SAGE Publications, 1995), 534.

[2] David Kaiser, "The Physics of Spin: Sputnik Politics and American Physicists in the 1950s," *Social Research* 73, no. 4 (2006): 1225.

Commission provided 90% of funding in the 1950s and 1960s.[3] With the rise of the Cold War a closer connection thus developed between science and the state.

This development gives rise to the question of what impact state funding had on the content of scientific research. When military organizations funded scientific research projects, they no doubt envisioned results that would enhance national security. With so much funding going into scientific research, one would expect that this would, therefore, bring fields with a clear military application to the forefront at the expense of fields less relevant in that area. Nonetheless, state funding of science, including funding coming from the military, was widely regarded as a positive development at the time. Historians of science in the 1960s and 1970s shared the view that state funding for science was a good thing and therefore did not inquire how it might affect scientific research.[4] Only towards the end of the Cold War did the question of how funding impacted the course of scientific research come to the forefront, especially due to a debate between Paul Forman and Dan Kevles. Focusing on physics, which saw the most military funding, Forman and Kevles agree that successful cooperation between civilian physicists and the state during World War II led to a continued alliance as the Cold War emerged, resulting in massive government funding for physics research. The two differ, however, in their views on how this alliance affected physics research.

As Forman argues in an article on quantum electronics published in 1987, the enormous amount of funding made physics research turn away from physicists' priorities to the military's prime concerns. Forman writes that although physicists might have had "the illusion of autonomy" believing they had persuaded the military to fund the research of their choosing, in reality, "physicists had lost control of their discipline."[5] Rather, the military

[3] Naomi Oreskes, "Science in the Origins of the Cold War," In *Science and Technology in the Global Cold War*, ed. by Naomi Oreskes and John Krige (Cambridge, MA: MIT Press, 2014), 19-20.

[4] Oreskes, 19.

[5] Paul Forman, "Behind Quantum Electronics: National Security as Basis for Physical Research in the United States, 1940-1960," *Historical Studies in the Physical and Biological Sciences* 18, no. 1 (1987): 229.

decided what physics research looked like by choosing to fund projects that promised to yield military applications, such as quantum electronics, which became an important field of research during the Cold War. Moreover, Forman notes, the military also indirectly influenced scientists to work in militarily useful subjects by visiting universities and organizing conferences. The Cold War thus drastically changed physics research, Forman argues, and although scientists might have thought they were in control, the shift to military applications and technologies shows that it was the military who decided what research would be carried out.[6]

In an article from 1990, Kevles goes against the idea that state funding limited physics research to fields with military applications – instead, he proposes that it diversified the field. First of all, he argues that Forman incorrectly implies that military funding "seduced" physicists away from "true basic physics."[7] According to Kevles, the military very well understood that basic research could provide new insights that might be very useful for military applications in the future. The atomic bomb, for example, could not have been made without insight into particle physics. Rather than leading physicists away from basic physics, Kevles argues, state funding was used for both applied and basic research and therefore resulted in diversification of physics research. Large basic research projects would never have been possible without state funding, Kevles writes, as private companies were not interested in investing large sums into, for example, particle accelerators that have no direct application. Second of all, Kevles disagrees with Forman's conclusion that physicists "lost control" and were unable to determine their research. Rather, the close relationship between science and the state increased physicists' power. The creation of advisory committees and boards meant

[6] Forman, 149-229; Oreskes, 18-23; Sarah Bridger, *Scientists at War* (Cambridge, MA: Harvard University Press, 2015), 9-12.

[7] Dan Kevles, "Cold War and Hot Physics: Science, Security, and the American State, 1945-1956," *Historical Studies in the Physical and Biological Sciences* 20, no. 2 (1990): 241.

that scientists had more political power and thus were able to influence where funding should go to. According to Kevles, physicists had all but lost control of their field during the Cold War – their alliance with the military enabled basic research and gave physicists more influence.[8]

In the 1990s, much of the literature on Cold War science built on the debate between Forman and Kevles. Leslie Stuart and Rebecca Lowen explore the influence military funding had on universities such as Stanford and MIT and support Forman's argument that the military-controlled research at universities. They focus on the "military-industrial-academic complex" in which universities were closely tied to the military and defense industries. Lowen writes that while Stanford could dictate the terms of their relationship with companies, the university had to accommodate to the military because it was too dependent on its funding. For example, Stanford decided to prioritize research areas that were more relevant to the national interest, resulting in a heavy focus on science and technology at the expense of social sciences and humanities. Moreover, results in these areas were often classified, even student work and dissertations on basic science, meaning "academic traditions were bent to accommodate changed military needs," Lowen writes, countering Kevles' argument that military funding greatly benefited basic research. Stuart and Lowen thus argue that Forman's idea of the military dominating scientific research was true for scientists working at universities due to the rise of the military-industrial-academic complex.[9]

Other works support Kevles' idea that scientists in the 1950s and 1960s gained influence and political power. Paul Edwards has introduced the idea of "mutual orientation": on the one hand, the military came to scientists with specific national-defense problems that

[8] Kevles, 239-264; Oreskes, 18-23; Bridger, 9-12.

[9] Rebecca S. Lowen, *Creating the Cold War University: The Transformation of Stanford* (Berkeley: University of California Press, 1997), 140; Stuart W. Leslie, *The Cold War and American Science: The Military-Industrial-Academic Complex at MIT and Stanford* (New York: Columbia University Press, 1993).

had to be solved, but on the other hand scientists could sell their research area by envisioning future military applications. This means that, contrary to Forman's argument, scientists had some influence over what research would be funded.[10] Jessica Wang also stresses the idea of scientists as active negotiators rather than passive victims of the military-industrial-academic complex. Since the use of the atomic bomb, scientists had "plunged directly into the domain of national-level legislative politics," Wang writes, taking political action to protest the military's use of science and technology. Like Kevles, she also stresses that since World War II scientists had joined the "top ranks of policymaking hierarchy," enabling a "direct route to political power."[11] Edwards and Wang thus argue that scientists had more means to take control of their relationship with the state.

In the past two decades, historians have broadened the debate by looking beyond the United States and the physical sciences. Hunter Heyck and David Kaiser, for example, write that the change in the relationship between scientists and the state cannot solely be contributed to the military-industrial-academic complex but also took place due to a global transformation which was only partly due to the Cold War.[12] In line with this idea, some historians have started to focus on transnational developments in science and areas other than the U.S., such as Western Europe and China.[13] Similarly, whereas historians previously focused mostly on areas such as physics and chemistry, scholars like David Hounshell and

[10] Paul N. Edwards, "From 'Impact' to Social Process: Computers in Society and Culture," in *Handbook of Science and Technology Studies*, ed. by Sheila Jasanoff, Gerald E. Markle, James C. Peterson & Trevor Pinch (Thousand Oaks: SAGE Publications, 1995), 259-61.

[11] Jessica Wang, *American Science in an Age of Anxiety: Scientists, Anticommunism, and the Cold War* (Chapel Hill: The University of North Carolina Press, 1999), 6.

[12] Hunter Heyck and David Kaiser, "New Perspectives on Science and the Cold War: Introduction," *Isis* 101, no. 2 (2010): 363.

[13] Jeroen van Dongen (ed.), *Cold War Science and the Transatlantic Circulation of Knowledge* (Leiden: Brill, 2015); Zuoyue Wang, "Transnational Science during the Cold War: The Case of Chinese/American Scientists." *Isis* 101, no. 2 (2010).

David Engerman have broadened the field by focusing on social science, showing that in this area, too, military funding played an important role.[14]

Historians who remained focused on the topic of physical sciences within the U.S. have complicated and moved away from the concept of the military-industrial-academic complex. Whereas previous work often treated scientists as a homogeneous group, Jessica Wang and Zuoyue Wang highlight differences between scientists and their relation to the state. Jessica Wang shows scientists' differing political views and how this impacted their relationship with the state; her focus on the Red Scare shows that the state not only wanted to work with scientists to enhance national security but could also view them as a potential threat. Zuoyue Wang emphasizes the many different science-related agencies within the government, their differing standpoints, and their changing relationship with the government throughout time.[15] Their work suggests that the idea of the military-industrial-academic complex did not do justice to the multifaceted relationship between the government and scientists. Other historians have moved away from the military as the main point of focus by putting forward other factors that influenced science during the Cold War. David Reynolds argues that the U.S. its capitalist economy ensured that consumer markets remained much more important than defense industries, meaning that science research did not only have to focus on military technology but also consumer technology.[16] Audra Wolfe notes that since the launch of *Sputnik*, the goal of government funding was no longer just new military applications but also the enhancement of national prestige, which could be achieved in various non-military areas. As a result, the government started to heavily fund civilian

[14] David A. Hounshell, "Rethinking the Cold War; Rethinking Science and Technology in the Cold War; Rethinking the Social Study of Science and Technology," *Social Studies of Science* 31, no. 2 (2001); David C. Engerman, "Social Science in the Cold War," *Isis* 101, no. 2 (2010).

[15] Zuoyue Wang, "Transnational Science"; Zuoyue Wang, *In Sputnik's Shadow: The President's Science Advisory Committee and Cold War America* (New Brunswick, N.J.: Rutgers University Press, 2008).

[16] David Reynolds, "Science, Technology, and the Cold War," in *The Cambridge History of the Cold War*, ed. by Melvyn P. Leffler and Odd Arne Westad (Cambridge: Cambridge University Press, 2010), 378-380.

organizations such as NASA, which focused on civilian rather than military technology and applications. Wolfe supports Forman's argument by writing that in these areas, too, the government largely decided what course scientific research should take to maximize national prestige.[17] Wolfe does not go into much detail, however, of what the implications of this prestige-oriented policy are for science. Whereas scholars have analyzed the military's influence, the effects of prestige on science during the Cold War thus remains overlooked.

Throughout this debate, the President's Science Advisory Committee has been frequently mentioned as an example of scientists working closely with the government, although its role is contested. Sarah Bridger builds on Kevles' argument by showing that the committee greatly enhanced scientists' political power, as PSAC provided direct access to the president; on the other hand, she suggests that PSAC worked in the interest of the government and the military. The scientists working on the committee were "patriotic, anticommunist, and idealistic," saw government service and increasing national security as part of their duty as scientists, and mainly provided advice on military issues, Bridger writes.[18] Other scholars have countered this idea by showing that PSAC strongly represented the interests of the scientific community. Richard Atkinson and William Blanpied, for example, show that PSAC had strong ties to research universities, as most members worked there, and fervently advocated for government funding in basic research.[19] Ronald Doel and Zuoyue Wang argue that the committee also worked in the interest of the scientific community by campaigning for scientific international cooperation rather than the classification of research, and show that the committee actively went against the interests of the military by advising to halt or greatly

[17] Audra J. Wolfe, *Competing with the Soviets: Science, Technology, and the State in Cold War America* (Baltimore: The Johns Hopkins University Press, 2013), 38-42, 89-94.

[18] Sarah Bridger, *Scientists at War* (Cambridge, MA: Harvard University Press, 2015), 18-23.

[19] Richard C. Atkinson and William A. Blanpied, "Research Universities: Core of the US Science and Technology System," *Technology in Society* 30, no. 1 (2008): 38-39.

reduce funding for military programs.[20] By looking at the specifics of PSAC's work in the White House, the latter group of historians thus make a compelling case that the committee did indeed represent the interests of the scientific community.

Whereas the debate on science in the Cold War has evolved away from the idea of the military-industrial-academic complex, references to PSAC have not. Scholarship on the committee still revolves around the discussion of whether or not the committee was part of the complex and mainly looks at its advice on military issues. As Wolfe argues, however, not only national security issues but also the desire for prestige influenced the government's funding of scientific research, with NASA as a prime example. This thesis builds on Wolfe's argument and addresses the effects of the government's wish for prestige on PSAC's scientists. By doing so, this thesis aims to pull PSAC into the recent developments of the debate on science and the state in the Cold War. The next chapters evaluate the committee's influence on policy regarding a manned moon landing, which was largely dominated by a wish for prestige rather than military concerns, and analyze the committee's response to the program becoming a project revolving around prestige rather than science. In doing so, this thesis touches on the core elements of the Forman-Kevles debate by providing insight on the government's influence on science as well as scientists' influence on the government's space policy during the early Cold War. At the same time, it addresses the underexposed effect of prestige-oriented government policies on PSAC's scientists and thus provides insight into the government's effect on science at large.

[20] Ronald E. Doel, "Scientists, Secrecy, and Scientific Intelligence: The Challenges of International Science in Cold War America," in *Cold War Science and the Transatlantic Circulation of Knowledge*, ed. by Jeroen van Dongen (Leiden: Brill, 2015), 29-30; Zuoyue Wang, *In Sputnik's Shadow*.

CHAPTER TWO

Eisenhower and his Scientific Friends

On 4 October 1957, the Soviet Union launched *Sputnik*, the first satellite to successfully orbit the earth. Although the satellite itself was not very impressive – it was not much more than a metal sphere slightly larger than a football – it had a big impact on the United States. The launch came as a shock to many Americans, who had not expected the Soviet Union to be able to technologically surpass them. The following day, the front page of the *New York Times* featured a big headline reading "Soviet fires earth satellite into space; it is circling the globe at 1800 m.p.h.; sphere tracked in 4 crossings over U.S."[1] It was no coincidence that the Soviet satellite crossed American soil – Sputnik was meant as a publicity stunt, broadcasting beeps that could be picked up by radios, flying over densely populated areas, and made extra shiny so that it was easy to spot.[2] It proved to be very effective: "the American people were deeply disturbed by *Sputnik*." John Rigden writes. "Many concluded that the Russians now controlled the skies."[3] Before, Americans could feel safe being separated from the Soviet Union by an ocean on either side, but now the Soviets had put an end to this sense of isolation by penetrating American skies. Furthermore, a rocket that was able to put a satellite into orbit would also be powerful enough to launch nuclear weapons.[4] Scientist Edward Teller, the inventor of the hydrogen bomb, even declared on television that "the United States has lost a battle more important and greater than Pearl Harbor." The Soviet Union's launch of Sputnik thus implied technological and military superiority, and many

[1] "Soviet Fires Earth Satellite into Space; It is Circling the Globe at 1800 m.p.h.; Sphere Tracked in 4 Crossings over U.S." *New York Times* (*NYT*), Oct. 5, 1957, p. 1.

[2] Yanek Mieczkowski, *Eisenhower's Sputnik Moment: The Race for Space and World Prestige* (Ithaca: Cornell University Press, 2013), 12.

[3] John S. Rigden, "Eisenhower, Scientists, and Sputnik," *Physics Today* 60, no. 6 (2007): 49.

[4] Mieczkowski, *Eisenhower's Sputnik* Moment, 11-16.

Americans wanted to see the U.S. government take action to catch up. Prominent Democrats, most notably Senate majority leader Lyndon B. Johnson, seized the opportunity to challenge the government by emphasizing the existence of a "missile gap" and insisted on measures to close it; military services used the occasion to lobby for increased funding of their rocket and missile programs.[5] It was at this moment that Eisenhower decided to form the President's Science Advisory Committee (PSAC), with which he would closely work together for the rest of his presidency to reduce the anxiety caused by Sputnik and to create a fitting space policy.

This chapter analyzes the extent to which PSAC was able to influence space policy and argues that this influence depended on a couple of factors: political relevance of science advice, political tact of the science adviser and PSAC as a whole, and the President's receptiveness towards new ideas. To evaluate these factors, this chapter first provides background information, both on Eisenhower's views and management style as well as PSAC's formation, its members, and the committee's general ideas on space, and then analyzes two specific moments: PSAC's first report in which the committee lays out what the American space program should look like, and the creation of space agency NASA.

In the first days after Sputnik, Eisenhower attempted to take away unrest by responding calmly. He assured the public that the Soviet achievement did not mean the U.S. was less powerful in either the technological or the military area. In a statement the President made four days after the launch, he pointed out that the U.S. had been working on launching a satellite for several years, but that this effort was part of an international scientific program. "Merging of this scientific effort with military programs," Eisenhower explained, "could have produced an orbiting United States satellite before now, but to the detriment of scientific goals and military progress." He countered the claims of missile gaps by stating that since the

[5] Rigden, "Eisenhower, Scientists, and Sputnik," 49-50; Zuoyue Wang, *In Sputnik's Shadow: The President's Science Advisory Committee and Cold War America* (New Brunswick, NJ: Rutgers University Press, 2008), 72.

satellite program was a scientific and not a military effort, the program "cannot be taken as an index of our progress in ballistic missile work."[6] All in all, Eisenhower assured during a press conference, the launch "did not increase his apprehensions over the national security of this country by 'one iota'."[7] Eisenhower had good reason to believe that the U.S. did not have to worry about Sputnik's technological and military implications and a potential missile gap: intelligence information provided by high-altitude U-2 spy plane flights over the Soviet Union had revealed the true state of Soviet missile production, which was not comparable to that of the United States. Due to the secrecy of the operation, however, Eisenhower was unable to reveal this to the public. The state of American missile programs was also largely kept secret to its citizens.[8] This "excessive security," Eisenhower's first science adviser James Killian later wrote, increased post-Sputnik panic because "people were woefully ignorant of how much qualitatively advanced and forehanded rocket technology had been under development."[9] Unaware of the military advancement the U.S had over the Soviet Union, many did not find reassurance in Eisenhower's calm response and took his remarks as a sign of indifference.

Furthermore, in his statement, Eisenhower neither recognized Sputnik's psychological impact or the need for increasing American prestige. For the President "prestige was a relatively minor factor in his broad-based conception of western strength," David Callahan and Fred Greenstein write.[10] Eisenhower believed American superiority to be evident through

[6] "Statement by the President: Summary of Important Facts in the Development by the United States of an Earth Satellite," October 9, 1957, Dwight D. Eisenhower's Office Files, reel 30, Roosevelt Institute of American Studies in Middelburg.

[7] "President Voices Concern on U.S. Missile Program, But Not on the Satellite," *NYT*, Oct. 10, 1957, p. 1.

[8] Mieczkowski, *Eisenhower's Sputnik Moment,* 73.

[9] James R. Killian, *Sputnik, Scientists, and Eisenhower: A Memoir of the First Special Assistant to the President for Science and Technology* (Cambridge, MA: MIT Press, 1977), xvii.

[10] David Callahan and Fred I. Greenstein, "The Reluctant Racer: Eisenhower and U.S. Space Policy," in *Spaceflight and the Myth of Presidential Leadership*, ed. Roger D. Launius and Howard E. McCurdy (Urbana, IL: University of Illinois Press, 1997), 21.

various aspects of American life such as the interstate highway system, supermarkets, and vaccinations, which did not appeal to the public – whether at home or abroad – like Sputnik did.[11] In the eyes of the public, the Soviets' success in space greatly enhanced their worldwide prestige. Conversely, a failed American attempt to launch a satellite two months later was thought to damage the country's image, as reflected by a *New York Times* headline reading "failure to launch test satellite assailed as blow to U.S. prestige."[12] A survey carried out by the United States Information Agency confirmed that people found achievements in space to be very important for the overall image abroad, and across the world, the Soviet Union was deemed well ahead of the U.S. in space for the next ten years. Moreover, "these beliefs have adversely affected American standing in other fields" besides space technology, the *New York Times* reported.[13] Although Eisenhower acknowledged that by accelerating the American space program to eventually beat the Soviets to the moon "we might conceivably gain some psychological advantage from doing it first," coincidentally the U.S. would "fall behind in everything else."[14] To Eisenhower, it was not worth taking military and technological resources off other projects for potential psychological or prestigious gain.

Eisenhower's sober reaction to Sputnik can be attributed to his strong political views. Firstly, Eisenhower was a fervent supporter of small government and therefore worked to keep federal spending to a minimum. For that reason, accelerating the American space program would mean to "fall behind in everything else": Eisenhower had already made available a large sum of money for the current satellite program and was reluctant to increase spending in space even further – extra funding in this area could therefore only come from

[11] Mieczkowski, *Eisenhower's Sputnik Moment*, 193.

[12] "Vanguard Rocket Burns on Beach; Failure to Launch Test Satellite Assailed as Blow to U.S. Prestige," *NYT*, Dec. 6, 1957, p. 1.

[13] "New Study Finds U.S. Prestige Off," *NYT*, Oct. 29, 1960, p. 10.

[14] "Legislative Leadership Meeting: Supplementary Notes," March 18, 1958, DDE's Legislative Meetings, reel 2, RIAS.

cuts in other programs. Secondly, tied to his wish to keep government spending in check, Eisenhower distrusted the military and its constant lobbying for increased funding (which he later warned for and famously dubbed the "military-industrial complex" in his farewell speech). He deemed national security to be of great importance, but mainly focused on missile detection and reconnaissance and believed improvements in these areas could be achieved through a few carefully selected, efficient defense projects. To Eisenhower, the military's promotion of missile projects in response to Sputnik's launch confirmed his distrust, and he feared that an accelerated space program would give rise to an ever-increasing sum of money going towards the Department of Defense (DOD).[15] To counter the public, political, and military call for an accelerated space program, Eisenhower frequently emphasized that the U.S. was not in a space race with the Soviet Union. "Our satellite program has never been conducted as a race with other nations," Eisenhower declared in his post-Sputnik statement. Instead, the space program would be based on "a proper and appropriate plan of scientific exploration," and the U.S. would "follow it positively rather than trying to follow along behind somebody else."[16]

Eisenhower's reluctancy to enter a space race with the Soviet Union produced political backlash that lasted throughout his presidency. Despite Eisenhower's emphasis that the American space program would continue to be based on scientific grounds, space policy became an area of political competition between the President and the Democratic majority in Congress as well as an international competition between the United States and the Soviet Union.[17] Eisenhower would continue to be pressured to put more money in space projects, to

[15] Sean N. Kalic, *US Presidents and the Militarization of Space, 1946-1967* (College Station: Texas A&M University Press, 2012), 26-34; Mieczkowski, *Eisenhower's Sputnik Moment*, 76-79, 82-89; Dwight D. Eisenhower, "Farewell Radio and Television Address to the American People," January 17, 1961.

[16] "Statement by the President: Summary of Important Facts in the Development by the United States of an Earth Satellite," October 9, 1957, DDE's Office Files, reel 30, RIAS; "Transcript of Eisenhower's News Conference on Domestic and Foreign Matters," *NYT*, Feb. 4, 1960, p. 12.

[17] Callahan, "The Reluctant Racer," 15.

accelerate the space program, and to enter a space race to redeem American prestige. As he was not up for reelection, this lowered the pressure somewhat to use space policy for popular gains (to the frustration of Vice President Richard Nixon, who was running for president and could neither show off with a new impressive space program nor reveal that the missile gap was nonexistent). Nonetheless, it remained difficult for the President to resist demands from many different groups for an all-out space race.[18]

Both to show that he was taking action and to fend off various pressure groups, shortly after Sputnik's launch Eisenhower appointed a Presidential Assistant of Science and Technology and established the President's Science Advisory Committee (PSAC). The first Assistant of Science and Technology, commonly referred to as science adviser, was James Killian, president of MIT. Although not a scientist or engineer but rather a science administrator, he was well-respected in the academic world and regarded by many scientists as a good choice for science adviser. Eisenhower wanted Killian to be able to formulate well-founded, independent advice on all kinds of scientific matters, and authorized him to attend all National Security Council (NSC) meetings, as well as gain access to all science and technology-related plans from the Department of Defense, Atomic Energy Commission, and the CIA.[19] The science adviser was also appointed as chair of PSAC. The committee was largely an upgrade of the previously existing Office of Defense Mobilization's Science Advisory Committee (ODM-SAC) to presidential status. The majority of the first-generation PSAC members were carried over from ODM-SAC and therefore Eisenhower was already familiar with them, but several new members were added as well. The committee was quite homogeneous and would largely remain to be so under Kennedy and Johnson: described as "a Cambridge mafia" by Zuoyue Wang, most members were either physicists or chemists who

[18] Mieczkowski, *Eisenhower's Sputnik Moment*, 23, 185-88.

[19] Killian, *Sputnik, Scientists, an Eisenhower*, 35-36.

held administrative positions at prominent academic institutions like Stanford or MIT. Many of them also had experience in working for the government, through ODM-SAC or other advisory committees but most notably during World War II for research on the radar or the atomic bomb.[20]

Due to its uniformity, most PSAC members held the same general ideas on what the American space program should look like. Because of the strong representation of academic scientists, PSAC was mostly concerned with the state of American scientific research. The space program, many members agreed, should therefore mainly focus on gaining new scientific knowledge. Just like Eisenhower, they believed that space programs should have scientific value rather than focus on copying Soviet achievements. At the same time, they also feared that excessive focus on space programs might divert government funding away from other scientific areas that were less popular, which they feared might in the long run negatively impact American scientific and technological capabilities in comparison to the Soviet Union. When Eisenhower met with ODM-SAC shortly after the launch of Sputnik, scientist Edwin Land expressed that science in the Soviet Union was "a way of life," enjoying wide support from the public and the government, whereas American scientists felt "isolated and alone."[21] PSAC believed that both the scientific community and the government could profit from closer cooperation and was a strong advocate for government support of basic research. Furthermore, PSAC advised the Eisenhower administration to promote basic science to the wider public as well as improve science education, hoping to see an influx of qualified scientists and engineers. Although this was partly out of self-interest, they also believed it to be in the national interest to have a strong, broadly-developed scientific community.[22]

[20] Wang, *In Sputnik's Shadow*, 84-85; Killian, Appendix 2 in *Sputnik, Scientists, and Eisenhower*.

[21] Wang, *In Sputnik's Shadow,* 76.

[22] President's Science Advisory Committee, *Strengthening American Science* (Washington, D.C.: Government Printing Office, 1958); President's Science Advisory Committee, *Education for the Age of Science* (Washington, D.C.: Government Printing Office, 1959); Killian, *Sputnik, Scientists, and Eisenhower*, 15-16.

Eisenhower's establishment of PSAC was not just for political show – he assigned a big role for Killian and PSAC in creating the administration's space policy. To know which projects should be funded and which agency would be most suitable in carrying out such projects, the President ordered PSAC to formulate a space program. In March 1958, PSAC's subcommittee on space presented their report *Introduction to Outer Space*. The report listed four reasons for space exploration: most importantly national defense and new opportunities for science, but also enhanced national prestige and the "urge of man to explore and discover." The report then continued to explain which projects would and would not be worth pursuing – refuting the military's claims that outer space would be the next battleground. Killian recalled that the Air Force, in particular, "made proposals that indicated an extraordinary ignorance of Newtonian mechanics."[23] The report clarified that satellites were not useful as weapons, noting that one cannot simply drop a bomb from a satellite and that "the earth would appear to be, after all, the best weapon carrier." Military projects that would be worth pursuing, however, were satellites for communication and reconnaissance. Additionally, the report mainly suggested scientific projects, emphasizing that "the cost of transporting men and material through space will be extremely high, but the cost and difficulty of sending *information* through space will be comparatively low," concluding that in the scientific area satellites could be very helpful as well for gathering data on the atmosphere, radiation from space, and the weather. The report included a timetable of what space projects to undertake, listing projects in geophysics, meteorology, and communication as "early," investigation of the moon and a manned earth orbit as "later," and a manned moon landing as "still later." Finally, the report concluded that "it would not be in the national interest to exploit space science at the cost of weakening our efforts in other scientific endeavors," and that the space program should be seen "as part of a balanced national effort

[23] Killian, *Sputnik, Scientists, and Eisenhower*, 112.

in all science and technology." This report thus clearly reflected PSAC's fear of the space program's potential damage to overall scientific research. Firstly, it prioritized scientific space projects over manned flights and excessive military activities; secondly, it emphasized that space science should be part of broad and balanced governmental support in science.[24]

Although for different reasons than the scientists, Eisenhower strongly agreed with the report. Whereas PSAC viewed scientific research as the main objective of space activities, the President expressed that in his view "the meeting of legitimate military needs is first; then comes the development of superboosters to get ahead of the Soviets eventually; and third is the scientific work."[25] Despite this difference in priorities, PSAC hit the right note. With this report, Eisenhower could show that he had scientific backing in rejecting extravagant military proposals and that outer space was unlikely to become a theater for war. On the other hand, the report supported reconnaissance projects, which Eisenhower deemed one of the most important aspects of defense. The report also reflected the President's wish to control government spending by downplaying expensive manned spaceflights and labeling it as a long-term goal. Eisenhower regarded the scientists' appeal for government funding of basic science to be much less problematic, as became apparent by his later support for a far-reaching education reform bill, called the National Defense Education Act, and funding for a particle accelerator at Stanford for research in high-energy physics.[26] All in all, Eisenhower was so pleased with the report and PSAC's briefing on it that he wanted the NSC and the Cabinet to receive the same briefing. Moreover, he ordered *Introduction to Outer Space* to be publicly released and wrote an introduction to it, stating that he found the report "so

[24] President's Science Advisory Committee, *Introduction to Outer Space* (Washington, D.C.: Government Printing Office, 1958).

[25] George B. Kistiakowsky, *Scientist at the White House: The Private Diary of President Eisenhower's Special Assistant for Science and Technology* (Cambridge, MA: Harvard University Press, 1968), 124.

[26] Wang, *In Sputnik's Shadow*, 142, 165.

informative and interesting" and praising it as a "sober, realistic presentation". The *New York Times* printed the entire report, and it became widely popular.[27]

It was no coincidence that Eisenhower's and PSAC's views on science and space policy dovetailed – the President had made sure to appoint scientists that he could easily work with. Eisenhower had many scientists to choose from when selecting his science adviser. Although Killian and the other PSAC members certainly enjoyed a high standing among scientists and the general public, there were more prominent and popular scientists available. Hydrogen bomb inventor Edward Teller and ex-Nazi rocket developer Wernher von Braun, for example, made frequent television appearances and were widely known among the public. Both Teller and von Braun publicly advocated for military-technological spectacles, precisely the types of projects that Eisenhower wanted to avoid.[28] The President disliked a "scientist acting like a politician," and remarked that "some scientists get a little too enthusiastic when suddenly in the limelight."[29] When he warned for a "scientific-technological elite" in his farewell speech on the military-industrial complex, Eisenhower privately revealed that he had scientists like von Braun and Teller in mind.[30] On the other hand, the President knew the ODM-SAC members and was especially familiar with Killian, who had successfully chaired an ad-hoc panel in 1955 to advise him on the inter-service rivalry in the military.[31] Eisenhower was aware that these scientists, too, had a personal agenda, but they did not push for it publicly or aim for military-technological projects like Teller and von Braun did. Knowing that PSAC shared many of his views on science, space, and the military,

[27] "Text of President's Science Aides' 'Introduction to Outer Space'," *NYT*, Mar. 27, 1959, p. 14.

[28] "Excerpts from the Comments of Senator Johnson, Dr. Teller and Dr. Bush," *NYT*, Nov. 26, 1957, p. 20; "U.S. Man-in-Space Predicted by '63," *NYT*, Aug. 19, 1958, p. 5.

[29] "Legislative Leadership Meeting: Supplementary Notes," Mar. 18, 1958, DDE's Legislative Meetings, reel 2, RIAS; Mieczkowski, *Eisenhower's Sputnik Moment*, 63.

[30] Wang, *In Sputnik's Shadow,* 177.

[31] Killian, *Sputnik, Scientists, and Eisenhower*, 42; Richard V. Damms, "James Killian, the Technological Capabilities Panel, and the Emergence of President Eisenhower's 'Scientific-Technological Elite'," *Diplomatic History* 24, no. 1 (2000): 57.

Eisenhower could make the committee responsible for shaping his science policy knowing that the outcome would support his views. Callahan and Greenstein argue that this was "characteristic of his hidden-hand approach to leadership": by appointing people around him who held similar views, he was able to turn issues over to others while ensuring that the administration remained heading in the right direction. The advantage of this approach was that by outsourcing his space policy to scientists, Eisenhower was depoliticizing the space program: as mentioned earlier, Eisenhower promoted the space program as "a proper and appropriate plan of scientific exploration," enabling him to fend off criticism that the program was a result of the President's conservative views.[32] Because Eisenhower had influence over which scientists would join PSAC, the committee's views aligned with Eisenhower's reluctancy to enter a space race, enabling the President to further his views on space policy while giving the scientists a large degree of freedom.

The relationship between Eisenhower and PSAC, however, was not just a one-way street in which Eisenhower used the scientists' ideas to further his goals: PSAC also influenced the President's decision-making. By understanding the political issues Eisenhower faced, Killian and PSAC were able to advance their views in a way that was helpful to the President. A memorandum from Killian to the President on 28 December 1957, shortly after the failed American satellite launch, shows the science adviser's political tact regarding sensitive issues. Killian anticipated difficult questions the President might face by explaining that "although it is probably true that we are at present behind the Soviets, we are in this position largely because we started much later and not because of inferior technology," and that failures of test launches are "normal and unavoidable occurrences in the development" which provide "a great deal of necessary information for the test crew."[33] *Introduction to*

[32] Callahan, "The Reluctant Racer," 38; "Transcript of Eisenhower's News Conference on Domestic and Foreign Matters," *NYT*, Feb. 4, 1960, p. 12.

[33] Killian, "Memorandum for the President," Dec. 28, 1957, DDE's Office Files, reel 19, RIAS.

Outer Space demonstrates a similar ability of the scientists to tune into Eisenhower's political struggles on space, as the report provided science-based arguments against large military space projects and excessive spending. At the same time, PSAC inserted its own beliefs as part of a solution to Eisenhower's problems. The committee shifted the space program away from the military, as Eisenhower wanted, and turned it into a scientific effort; it argued that being behind the Soviet Union in satellite development was a not defense issue, but rather a scientific research-issue. It supported Eisenhower's wish for limited government spending by arguing that investing billions in military spectacles or a manned spaceflight was not worth it; instead, investing part of that money in scientific research would be enough. Because Killian understood Eisenhower's views on military involvement in space and government spending, he was able to tactically present PSAC's science-based space policy in a way that appealed to the President.

Although Killian's understanding of Eisenhower's views certainly helped to advance PSAC's views, the committee's influence on space policy was not merely determined by how useful the committee was to Eisenhower on a political level – another important factor was the President's openness towards scientific ideas. Instead of meeting with his existing advisers after Sputnik's launch, the President formed a new committee that consisted of scientists with very little White House experience compared to others in his administration, gave them the freedom to express their unhampered views on space policy, and took those into serious consideration. When Eisenhower wanted PSAC to brief the Cabinet and NSC on *Introduction to Outer Space,* he attended both meetings and was eager to learn how satellites worked.[34] Eisenhower thus displayed an interest that went beyond how PSAC could be of political use, making it easier for the committee to bring forward suggestions – like supporting basic research in science – that did not fit Eisenhower's agenda directly but were

[34] Wang, *In Sputnik's Shadow*, 92.

received positively nonetheless. Furthermore, as the request to brief the Cabinet and NSC shows, Eisenhower's enthusiasm added weight to PSAC's position within the White House.

The dynamics described above – Eisenhower need for science advice to fend off space race enthusiasts, PSAC's political tact, and Eisenhower's openness towards the committee's ideas – were also clearly visible in the selection of a space agency, in which PSAC and the science adviser played an important role. Although the DOD would still carry out space projects of military value, like the reconnaissance satellites, other programs were to be assigned to another agency, either the National Advisory Committee for Aeronautics (NACA) or the Advanced Research Projects Agency (ARPA). The main difference was that NACA was a civilian agency, whereas ARPA was a military one. Eisenhower preferred ARPA, which already had developed better products, but Killian and PSAC's scientists believed that NACA was the right choice. The latter agency was "under the lay direction of some of the best civilian talent in the country" and "operated with freedom from political influence and unencumbered by the government bureaucracy," Killian wrote, and PSAC thus deemed NACA more suitable for carrying out scientific research.[35] During a meeting with Eisenhower, Killian opposed the President's choice for ARPA and explained his preference for scientific research in space to be conducted outside the military sphere. Eisenhower agreed that scientific research would be better off under a civilian agency and ordered a bill to be drafted on NACA becoming the new space agency. The agency was renamed as the National Aeronautics and Space Administration (NASA). Many teams working on space research under the military were moved to NASA; by choosing NACA, Eisenhower was thus able to further control military influence on space projects.[36]

[35] Killian, *Sputnik, Scientists, and Eisenhower*, 130-31.

[36] Wang, *In Sputnik's Shadow*, 94-97.

Here, too, Killian was able to influence the President's decision-making on space in PSAC's favor, both because the science adviser knew how to appeal to Eisenhower and because Eisenhower was open to his influence. George Kistiakowsky, Killian's successor as Eisenhower's science adviser, recalled that the choice of space agency was an important issue and that Killian "played a major role in [NASA's] creation."[37] He appealed to Eisenhower's wish for the military not to dominate the space program, which would be easier if the new space agency was a civilian one. The final choice for NACA also shows Killian was willing to go against the President when he felt it would benefit scientific research. The outcome goes against Callahan and Greenstein's earlier mentioned "hidden-hand approach" in which Eisenhower turned the decision-making process over to people he knew supported his views: the decision for NACA means that space policy did not just consist of the President's existing ideas backed up by his science adviser. Killian and PSAC were able to change the President's mind and make a real impact on the administration's plans in space. Killian, however, was able to influence space policy because Eisenhower let him – if the President had felt strongly about ARPA being the right agency the outcome would have been different. As Callahan and Greenstein write, "there is no evidence that [Eisenhower] anguished personally over how to organize space policy," and the issue of whether ARPA or NACA would be the right choice was not the President's most pressing matter.[38] Killian confirmes that Eisenhower "was not convinced that space would become all that important"; he was, therefore, probably willing to go along with Killian after hearing his preference.[39] The science adviser's influence thus depended on Eisenhower's willingness to leave important decisions up to him on the one hand and his ability to take up such opportunities on the other hand.

[37] George B. Kistiakowsky, "Observations on Presidential Science-Advising: An Interview by William T. Golden (Summer 1979)," in *Science and Technology Advice to the President, Congress, and Judiciary*, ed. William T. Golden (New York: Pergamon Press, 1988), 494.

[38] Callahan, "The Reluctant Racer," 39.

[39] Killian, *Sputnik, Scientists, and Eisenhower*, 137.

Regardless of their influence with the President, the committee sometimes struggled to keep the space program science-oriented because of NASA, which quickly became a large and independent agency. The establishment of NASA meant less military involvement in space, but it did not guarantee a balanced, science-based space program: James Killian already foresaw that "the problem [with NASA] would rather be one of overenthusiasm if anything."[40] In 1959, Killian resigned and was succeeded by George Kistiakowsky, a Ukrainian-born chemist at Harvard University and expert on explosives, who had been a member of PSAC since its formation. By the time he became the president's science adviser, NASA had clear plans to accelerate the manned flight program in an attempt to beat the Soviet Union. Kistiakowsky thus needed to keep NASA on track in pursuing the scientific space program that PSAC had intended, rather than start a space-race for prestige. He understood that urging NASA to stop competing with the Soviet Union could have "a frightful political effect" with the wider public; he agreed with PSAC that they would have to accept competition with the Soviet Union as part of the space program, but that scientific research would remain to be the most important aspect of space projects. Kistiakowsky closely evaluated NASA's work, criticizing the agency for "too much hardware and not enough science" and too much money being spent on "missions that are many years off," to the dismay of NASA's administrators.[41] In this case, because Eisenhower did not interfere with the precise execution of his space policy, PSAC struggled to keep the much larger NASA in check without the active backing of the President.

Apart from keeping NASA in check, PSAC faced the first presidential election since its creation, causing uncertainty about the future of space programs and even PSAC itself. Kistiakowsky tried to ensure as much as possible that the next administration would continue

[40] "Legislative Leadership Meeting: Supplementary Notes," Apr. 1, 1958, DDE's Legislative Meetings, reel 2, RIAS.

[41] Kistiakowsky, *Scientist in the White House*, 115, 124.

to make use of PSAC and adopt the current space policy. He made an effort to remain nonpartisan during the election period, as to not appear overly affiliated with Eisenhower's administration. Furthermore, a PSAC panel estimated the costs of manned spaceflights so that the next administration would be aware of the financial consequences of such an undertaking. Shocking Eisenhower, the panel reported that landing a man on the moon would require "an additional national expenditure in the vicinity of 26 to 38 billion dollars."[42] Kistiakowsky and PSAC thus showed political tact in thinking beyond the elections as to not jeopardize their position in the White House, but it also shows that the committee faced uncertainties in which Eisenhower's support was of no help.

Despite these minor setbacks, PSAC enjoyed an important position during the Eisenhower administration, as shown by the good relationship Eisenhower had with PSAC and specifically science advisers Killian and Kistiakowsky, which is likely both a source for and a result of their fruitful cooperation in shaping space policy. According to I. I. Rabi, one of PSAC's most prominent members, one of the most important conditions for successful science advising was a good relationship between the science adviser and the president.[43] Killian underlined the importance of his relationship with Eisenhower, writing: "my effectiveness would be directly related to the relationship I would be able to maintain with the president."[44] Surely, both Killian and Kistiakowsky succeeded in this area. When Killian returned to MIT after one and a half years of service, Eisenhower wrote to tell him how he valued their "association and friendship," and Killian responded to the President's letter in the same way.[45] Although Kistiakowsky described his meetings with Eisenhower as "informal"

[42] President's Science Advisory Committee, "Report of the Ad Hoc Panel on Man-in-Space," December 16, 1960, NASA Historical Reference Collection, History Office, NASA Headquarters, Washington, D.C., https://www.hq.nasa.gov/office/pao/History/report60.html.

[43] I. I. Rabi, "The President and His Scientific Advisers," *Technology in Society* 2, no. 1-2 (1980): 15.

[44] Killian, *Sputnik, Scientists, and Eisenhower*, 32.

[45] Dwight D. Eisenhower, letter to Killian, Jul. 16, 1959, and James R. Killian, letter to Eisenhower, Jul. 31, 1959, DDE's Office Files, reel 19, RIAS.

but “largely on the business level,” one PSAC member believed that the President “liked Kistiakowsky even better than he did Killian.”[46] Eisenhower referred to PSAC as a whole as “my scientists” or “my scientific friends” and later revealed that he found his meetings with the committee one of the most enjoyable moments of his presidency.[47] Although it is hard to prove that this good relationship directly translated into political influence, it probably made the President at least more perceptive to the scientists’ ideas and opinions and thus made it easier for PSAC to influence space policy.

All in all, PSAC became an influential committee under Eisenhower that played a big role in shaping the President’s space policy. This influence can be attributed to three factors: political relevance of science advice, political tact of the science adviser, and the president’s receptiveness to new ideas. All three factors are visible in PSAC’s report *Introduction to Outer Space*. PSAC’s advice was highly relevant for Eisenhower during Sputnik’s aftermath because it enabled him to counter criticism, avoid a growing military influence in space, and argue against expensive programs; PSAC displayed political tact by framing their wish for scientific research in a way that appealed to the President; lastly, because Eisenhower was open to new ideas, he gave PSAC room to come up with new proposals on space policy. Later on, PSAC’s success in arguing for NACA as the new space administration was again due to Killian’s political insight by showing Eisenhower it would lead to less military influence; Eisenhower, on his part, was open to hearing his science adviser’s arguments and willing to change his mind. Kistiakowsky showed similar political tact in his dealing with NASA and the upcoming elections. Overall, the good relationship between the scientists and Eisenhower signifies that Eisenhower was happy with PSAC’s work and that it was easy for the scientists to get the President’s attention.

[46] Kistiakowsky, *Scientist in the White House*, 241-242; Hans Bethe quoted in Wang, *In Sputnik’s Shadow*, 106.

[47] Killian, *Sputnik, Scientists, and Eisenhower*, 241; Dwight D. Eisenhower, “Text of Address by the President Delivered from the Oval Office in the White House on ‘Science in National Security’,” November 7, 1957.

In evaluating PSAC’s impact on science policy in space, the question remains whether the scientists were able to truly influence Eisenhower or brought forward ideas the President already was in favor of. After all, Eisenhower was able to appoint scientists whose ideas on science, space, and the military largely overlapped with his own. On one hand, Killian’s “profound influence in the formulation of scientific programs to meet the Soviet satellites,” as the *New York Times* reported, was because of his understanding of the political issues Eisenhower faced in outer space and his ability to help the President resolve such issues while at the same time promoting the interest of the scientific community, an ability that Kistiakowsky and other PSAC members shared.[48] On the other hand, it is important to recognize that Eisenhower’s appointment of the committee meant that he was open to their advice and that the President willingly let them influence his space policy. Crucially, the next presidents would inherit, rather than appoint, the science advisory committee. As the next chapters will show, the degree of influence the scientists were to enjoy in shaping space policies of future administrations at times strongly depended on the president’s willingness to receive and implement their advice.

[48] “Killian Resigns as Science Aide,” *NYT*, 29 May 1959, p. 1.

CHAPTER THREE

Kennedy and the Race for Prestige

With John F. Kennedy coming into the White House, PSAC members had to ensure the continuation of science advising. Despite most members being Democrats, the scientists avoided affiliation with a single candidate during the campaigning period and supported both Kennedy and Nixon, hoping that PSAC would be able to continue its science policy regardless of the outcome of the election.[1] The exception was PSAC member Jerome B. Wiesner, an electrical engineering professor at MIT who had served on the committee since its formation and provided Kennedy with scientific advice during the election period. Wiesner had known Kennedy since his campaign for senator of Massachusetts in 1952. Wiesner recalled that Kennedy would occasionally call "to ask me about certain scientific and military issues that he had an interest in," and the president-to-be continued to do so during the election period.[2] Once Kennedy was elected, he appointed Wiesner as his science adviser and authorized him to attend NSC, Cabinet, and NASA council meetings, just as Eisenhower had done.[3] Although Kennedy initially questioned the idea of keeping the same members on PSAC because they had served under a Republican president, Wiesner convinced him that "their allegiance was to the institution of the presidency."[4] In a letter to Wiesner, appointing him as chairman of PSAC, Kennedy underlined his support for the committee: "I have a high regard for the past accomplishments of the Committee … I shall rely heavily on the

[1] Wang, *In Sputnik's Shadow*, 184.

[2] Jerome B. Wiesner, "Kennedy," in *Jerry Wiesner: Scientist, Statesman, Humanist: Memories and Memoirs*, ed. by Walter A. Rosenblith (Cambridge, MA: MIT Press, 2003), 267-268.

[3] John F. Kennedy, letter to Jerome B. Wiesner on appointment as science adviser, Jan. 23, 1961, Office of Science and Technology (OST), reel 64, John F. Kennedy Presidential Library (JFKPL).

[4] Wiesner, "Kennedy," 273.

Committee for wise counsel."[5] As Kennedy became president PSAC was off to a good start: the committee and science adviser would be able to continue their work and enjoy the same responsibilities and status as they had under Eisenhower.

This chapter analyzes how PSAC's role developed under President Kennedy and argues that its influence on space policy declined and became more complicated – despite Wiesner's political tact and long-time connection with the President – because the committee's advice was no longer politically useful. From the moment Kennedy changed his stance on space and announced to land a man on the moon before the end of the decade, PSAC struggled to impact space policy. First, this chapter will provide an overview of Kennedy's initial stance on space, then an analysis of his decision to accelerate the Apollo program and Wiesner's role in that turning point, and lastly how PSAC responded to the politicization of the space program and the different ways in which the committee tried to remain involved. Central to the analysis of PSAC's influence are the three factors that shaped the committee's role under Eisenhower: political relevance, the science adviser's political tact, and the president's receptiveness towards advice.

As a senator, Kennedy had criticized Eisenhower for his mild reaction after the Sputnik launch and continued to do so during his campaign. Yanek Mieczkowski argues that one of the reasons Kennedy became president was his understanding of the link between space and national status, which Eisenhower had ignored.[6] In one of his campaign speeches, Kennedy argued that the "people of the world" used to admire American technological capabilities, but that it was uncertain which country would be the technological leader in the future, as "the first vehicle in space was called Sputnik, not Vanguard" and the first dogs to

[5] John F. Kennedy, letter to Jerome B. Wiesner on appointment as chair of PSAC, Jan. 23, 1961, Office Files (digital identifier: JFKPOF-086-010-p0038), JFKPL.

[6] Yanek Mieczkowski, *Eisenhower's Sputnik Moment: The Race for Space and World Prestige* (Ithaca: Cornell University Press, 2013), 6.

return from space "were named Strelka and Belka, not Rover or Fido."[7] In creating a preliminary space policy, Kennedy's team thus strongly took into consideration the question of how to increase prestige. A report from his aides noted that scientific achievements in space did not contribute enough to the American image because "these accomplishments are not readily appreciated by the layman." Manned missions were most suitable to increase the American image, even though such missions would "contribute relatively little to science." This did not mean, however, that Kennedy planned to turn away from Eisenhower's focus on science in space. Unlike Eisenhower, Kennedy was willing to spend more, and he planned to increase funding in basic research and international cooperation on scientific space programs. The "best possible recommended program" put forward by Kennedy's team focused on science, reconnaissance, and unmanned and manned circumlunar flight, with an eventual manned lunar landing beyond 1970.[8] Initially, landing a man on the moon was thus not Kennedy's main goal in space. All in all, this program was not that different from the recommendations in the *Introduction to Outer Space* report PSAC had written for Eisenhower, which focused on scientific research and international cooperation while acknowledging the factor of prestige and the possibility of a manned lunar landing in the long run.

During the transition period, Wiesner was important in advising the president-elect on space matters. Upon Kennedy's request, Wiesner chaired a PSAC panel on space that studied the current status of the space program and provided a report commonly referred to as "the Wiesner report." According to NASA's deputy administrator Hugh Dryden, this report "was the only knowledge which President Kennedy on coming into office had about the NASA

[7] "Remarks of Senator John F. Kennedy," Civic Auditorium, Portland, Oregon, Sept. 7, 1960, Presidential Campaign Files, (digital identifier: JFKCAMP1960-1059-012-p0013), JFKPL.

[8] "Briefing Paper on Space," undated but between August 30 and Oct. 31, 1960, Presidential Campaign Files, (digital identifier: JFKCAMP1960-0993-020), JFKPL.

space program," and was important for the President's outlook on space policy at the beginning of his term.[9] The panel devoted much attention to prestige in space, acknowledging that "during the next few years the prestige of the United States will in part be determined by the leadership we demonstrate in space activities." The report also argued, however, that it was unwise from a prestige perspective to put manned missions forward as the main objective in space, as this would emphasize the weakest area of the American space program. Next to manned missions "scientific objects must be assigned a prominent place," the report advised, as this was the U.S. its strong suit. The report criticized NASA for not focusing enough on scientific research and a lack of scientific manpower within the agency. Next to the promotion of science, the report made two other recommendations. It advocated for better management of NASA's space activities: according to Wiesner, lack of decisive management created a "critical management problem," which needed urgent attention once Kennedy assumed office. Also, the report promoted international cooperation, stating that long range-space projects should be seen "as projects of all mankind" rather than as part of a competition. The report was published a few days before Kennedy was inaugurated.[10]

The Wiesner report clearly promoted PSAC's standpoints on space policy. It reflected the views PSAC had put forward during the Eisenhower administration: the report argued that the position of manned missions within the overall program should not be exaggerated, and advocated for the advancement of scientific research through space missions and international cooperation.[11] The report also reflected PSAC's past struggles to keep NASA on track: Eisenhower's first science adviser James Killian had warned of NASA's overenthusiasm and his second science adviser George Kistiakowsky had criticized the agency for focusing too

[9] Hugh L. Dryden, Oral History Interview, March 26, 1964, Oral History Archive (digital identifier: JFKOH-HLD-01), JFKPL.

[10] "Report to the President-Elect of the Ad-Hoc Committee on Space," Jan. 10, 1961, NASA History Office; Jerome B. Wiesner, letter to Theodore C. Sorensen, Dec. 19, 1960, in *Jerry Wiesner*, 457-59.

[11] Wang, *In Sputnik's Shadow*, 233.

much on a space race rather than following the administration's space policy. This report shows Wiesner continued to keep an eye on NASA, closely analyzing and criticizing its management and programs. This critique can be traced back to PSAC's core belief that the American space program should be a balanced effort: between military and prestige projects on the one hand and scientific projects on the other hand, and also between the space program and other scientific research areas on earth.[12] During the transition period, PSAC underlined this belief once more in a report reviewing the committee's major actions under the Eisenhower administration.[13] Wiesner also made sure to emphasize this need for balance to Kennedy's adviser Ted Sorensen, writing that the large expected costs for the space program could not be justified by its scientific outcomes. "I do not know a scientist who would support even the present level of space exploration … solely for the purely scientific goals," Wiesner wrote, and continued by warning that the expenditure would "undoubtedly impair our ability to support other areas of governmental activity, including real science."[14] As Kennedy's unofficial science adviser during the election and transition period, Wiesner thus strongly promoted PSAC's views.

On the other hand, Wiesner also clearly kept Kennedy's interests in mind. During his campaign, Kennedy had brought up space as an area that needed improvement, and Wiesner recalled in his memoirs that he "wouldn't be able to ignore what was called 'the space problem' after Kennedy assumed office." He was aware that Kennedy found prestige much more important than Eisenhower and therefore considered a bolder space program.[15] The Wiesner report not only made scientific arguments but also took into account the program's

[12] John M. Logsdon, *The Decision to Go to the Moon: Project Apollo and the National Interest* (Cambridge, MA: MIT Press, 1970), 19.

[13] "Major Actions of the President's Science Advisory Committee, November 1957 – January 1961," Jan. 13, 1961, OST, reel 64, JFKPL.

[14] Wiesner, letter to Theodore C. Sorensen in *Jerry Wiesner*, 459.

[15] Wiesner, "Kennedy," 275-78.

effect on American status abroad and made sure to emphasize the gain in prestige tied to recent American scientific successes in space. Furthermore, Wiesner was fully aware of the psychological and political implications of the Soviet Union's advantage in space. When he found out that the Soviets were soon going to launch its first manned satellite, he warned Ted Sorensen and advised to "prepare now to meet the propaganda psychological impact of such a success." Although Wiesner also made clear that a crash program in space would not be the right response, joking that "probably the right approach is to make a hero of the Soviet astronaut and offer him a movie contract," he seriously took into consideration the issue of prestige, knowing that it was important to Kennedy.[16]

At the beginning of his term, Kennedy did not accelerate the space program and largely followed the recommendations presented by Wiesner and PSAC. According to Richard Reeves, Kennedy was not very enthusiastic about space, and "the only thing that had prevented Kennedy from trying to push space of the American agenda early in his term was the enthusiasm of Vice President Johnson."[17] When Kennedy was shown the cost estimates for a manned lunar landing made by Hornig's Man-in-Space panel under Eisenhower, he agreed with the former president that the operation was too expensive.[18] Although NASA hoped that the new administration would reverse Eisenhower's decision to put the manned missions on the back burner, deputy administrator Dryden admitted that Kennedy had not given them any cause for optimism.[19] Indeed, when NASA asked for more funding for their manned program in their first meeting with the president, Kennedy postponed this decision. He wanted to wait for PSAC's evaluation of the program, which shows that Kennedy was

[16] Wiesner, letter to Theodore C. Sorensen, 458-59.

[17] Richard Reeves, *President Kennedy: Profile of Power* (New York: Simon and Schuster, 1993), 138.

[18] Kistiakowsky, *Scientist in the White House*, 409.

[19] Dryden, Oral History Interview.

both relying on PSAC and not very eager to accelerate the space race.[20] Kennedy also followed other PSAC recommendations. To improve NASA's managerial capabilities, he appointed long-time government official James Webb as the new head administrator of NASA, whom Kennedy said was "someone who has had experience with the resolutions of large policy questions."[21] In his early speeches, he also called for cooperation in science and in space. His inaugural address, Kennedy declared: "let both sides seek to invoke the wonders of science instead of its terrors. Together let us explore the stars…"[22] All in all, President Kennedy and PSAC seemed to be on the same page when it came to the space program.

The reason Kennedy followed the Wiesner report can be attributed to the same factors that accounted for PSAC's influence under Eisenhower. Firstly, Wiesner's advice was politically relevant to Kennedy as it aligned with the President's ideas on space: Kennedy lacked interest and was not very eager to accelerate the manned moon landing because of the costs, and the Wiesner report gave Kennedy a reason to largely continue the plans laid out under Eisenhower and devote his attention to other topics. Secondly, Wiesner displayed political tact by framing his advice in terms of prestige. By arguing that NASA should focus on American strong suits like scientific accomplishments, rather than manned programs, Kennedy could be assured that choosing to continue the current program would add to American prestige, too. Lastly, Kennedy was receptive to what Wiesner had to say, as he knew little about the space program and did not have a strong opinion on the matter. The fact that Kennedy knew Wiesner well and had asked him for science advice many times before undoubtedly added to his openness towards Wiesner's ideas as well. Relevance, Wiesner's

[20] Logsdon, *The Decision to Go to the Moon*, 99; Dryden, Oral History Interview.

[21] Kennedy quoted in "Address by James E. Webb, Administrator, NASA" at National Press Club, Sept. 12, 1961, John F. Kennedy (JFK) Office Files part 2, reel 9, RIAS.

[22] John F. Kennedy, Inaugural Address, Jan. 20, 1961, Historic Speeches (digital identifier: USG-17), JFKPL.

tact, and Kennedy's receptiveness thus ensured PSAC's influence at the beginning of the new President's term.

Events in the following weeks would change Kennedy's and PSAC's consensus on space. In April, the Soviets launched their first manned satellite, as Wiesner had predicted. Cosmonaut Yuri Gagarin successfully orbited the earth and returned safely. Like the launch of Sputnik, it received a lot of media attention and marked another clear win for the Soviets in space.[23] Kennedy congratulated Khrushchev on this achievement, but there was not much else his administration could do in the short term. In a press conference the day after Gagarin's flight, the President received remarks that Americans were "tired of being … second to Russia in the space field," and was asked multiple times how he would adapt the space program to catch up. Kennedy assured the press that "no one is more tired than I am," and unlike Eisenhower, acknowledged multiple times that the United States was indeed behind.[24] Only a few days later, Kennedy experienced another embarrassment: the Bay of Pigs fiasco, in which Cuban exiles trained by the CIA invaded Cuba to overthrow Fidel Castro's government. The US-backed forces were defeated within a few days and American involvement was exposed.[25] These events marked a difficult start for Kennedy's presidency, and according to Wiesner "the President felt some pressure to get something else in the foreground."[26] With the American image damaged by Gagarin's flight and the Bay of Pigs, Kennedy turned to the space program as a means of increasing national prestige.[27]

[23] "187-Mile Heigh: Russians Succeed in Orbiting an Astronaut and Returning him Safely to Earth," *NYT,* Apr. 12, 1961, p. 1.

[24] "Text of President Kennedy's News Conference on World and Domestic Affairs," *NYT*, Apr. 13, 1961, p. 18.

[25] John F. Kennedy, "Address before the American Society of Newspaper Editors," Apr. 20, 1961, Office Files (digital identifier: JFKPOF-034-018-p0002), JFKPL.

[26] Wiesner quoted in Logsdon, *The Decision to Go to the Moon*, 102.

[27] Michael R. Beschloss, "Kennedy and the Decision to Go to the Moon," in *Spaceflight and the Myth of Presidential Leadership*, ed. Roger D. Launius and Howard E. McCurdy (Urbana, IL: University of Illinois Press, 1997), 63; Walter A. McDougall, *The Heavens and the Earth: A Political History of the Space Age* (New York: Basic Books, 1986), 303-05; Logsdon, *The Decision to Go to the Moon*, 100-04.

Towards the end of April 1961, Kennedy shifted from holding off more funding for NASA to contemplating an all-out space race. To recover from the Soviet Union putting the first man in space and the Bay of Pigs fiasco, the President wanted a space program that "promises dramatic results in which we could win."[28] Before making the decision to put a man on the moon, however, the President wanted to make sure that accelerating the space program was the best way to boost the American image. Wiesner recalled that Kennedy "talked to hundreds of people in the process of making his decision and he weighed the costs with real concern."[29] Among all those people, Vice President Johnson was an important influence and a fervent advocate of an expanded space program.[30] Like Kennedy, Johnson evaluated the space program in political terms. Johnson warned the President that "we are neither making maximum effort nor achieving results necessary if this country is to reach a position of leadership."[31] NASA administrator James Webb and secretary of defense Robert McNamara also pushed for a space program aimed at increasing national prestige, writing that the program should be seen as "part of the battle along the fluid front of the Cold War."[32] Kennedy, too, saw the possible gain in prestige as the most compelling argument for pursuing manned missions in space. Nonetheless, he remained concerned by the enormous costs, even though NASA had provided a much lower estimate of the costs involved in putting a man on the moon than Hornig's Man-in-Space panel had.[33] The turning point came in May when NASA launched its first astronaut into space. From that moment on, Wiesner recalled,

[28] Kennedy to Lyndon B. Johnson, "Memorandum for Vice President," undated, JFK's Office Files part 1, reel 3, RIAS.

[29] Jerome B. Wiesner, "John F. Kennedy: A Remembrance," *Science* 142, no. 3596 (1963): 1149.

[30] Dryden, Oral History Interview; Reeves, *President Kennedy: Profile of Power*, 138-39; Wang, *In Sputnik's Shadow*, 220.

[31] Johnson to Kennedy, "Memorandum for the President," Apr. 28, 1961, JFK's Office Files part 1, reel 3, RIAS.

[32] James E. Webb and Robert S. McNamara to Johnson, "Recommendations for Our National Space Program: Changes, Policies, Goals," May 8, 1961, p. 8, National Security Files (digital identifier: JFKNSF-307-004-p0033), JFKPL.

[33] Kistiakowsky, *Scientist in the White House*, 409; Dryden, Oral History Interview.

Kennedy was convinced that a manned lunar landing was the way forward.[34] A few weeks later, Kennedy announced to Congress that "this nation should commit itself to achieving the goal, before this decade is out, of landing a man on the moon."[35]

In making this decision, Kennedy frequently consulted with Wiesner at first, but the science adviser's role soon diminished. PSAC had already made clear in the Wiesner report that "man-in-space cannot be justified on purely scientific grounds" and stuck to its argument that a manned lunar landing was far too expensive for the possible results it could bring, whether in terms of science or in terms of prestige.[36] Although Wiesner was invited to numerous meetings on the space issue, it soon became clear that the science adviser could be of no help to Kennedy.[37] In his conversations with Wiesner, the President sympathized with PSAC's standpoint, but made clear his prioritization of prestige over scientific benefits: "if you had a scientific spectacular on this earth that would be more useful – say desalting the ocean – or something that is just as dramatic and convincing as space, then we would do it."[38] The lunar landing had become, as Wiesner put it, "a political, not a technical issue […] it was a use of technological means for political ends."[39] Together with Bureau of Budget director David Bell, who also worried about the enormous costs, Wiesner and PSAC were the only ones in Kennedy's inner circle who objected to the acceleration of manned missions in space.[40] The committee's position was further undermined when the President received

[34] Wang, *In Sputnik's Shadow*, 221.

[35] John F. Kennedy, "Address to Joint Session of Congress," May 25, 1961, Historic Speeches (digital identifier: TNC-200-2, JFKPL.

[36] "Report to the President-Elect of the Ad-Hoc Committee in Space," Jan. 10, 1961, NASA History Office; Robert Dallek, *An Unfinished Life: John F. Kennedy, 1917-1963* (New York: Back Bay Books, 2004), 392.

[37] Theodore C. Sorensen, "A View from the White House," in *Jerry Wiesner*, 41; John M. Logsdon, *John F. Kennedy and the Race to the Moon* (New York, NY: Palgrave Macmillan, 2011), 78-89.

[38] Logsdon, 83.

[39] Logsdon, 90.

[40] David E. Bell to Kennedy, "Memorandum for the President," March 23, 1961, Office Files (digital identifier: JFKPOF-082-007-p0102), JFKPL.

support from another group of prominent scientists from the National Academy of Sciences, who came out with a report that strongly approved of manned missions in space.[41] When Kennedy put Johnson in charge to further investigate the space issue, Wiesner was no longer invited to meetings on the topic.[42] The science adviser did not raise objections, fearing that it would lead to an unnecessary confrontation – he understood very well that he represented one interest among many and was used to not getting his way, remarking that "the president often decided to disregard the PSAC's favored position … [if] a stand was not politically viable."[43] Wiesner also did not further discuss the issue with PSAC, knowing that the President and Vice President were no longer interested in scientific arguments.[44]

Why did Wiesner suddenly lose influence? Lack of a feeling for the political situation the science adviser found himself appears not to be the problem: he made sure the President was aware of his and PSAC's opposition to a manned lunar landing but also knew when to stop promoting his viewpoint. Rather, it was not about the way Wiesner was conveying the message, but the message itself: because Kennedy politicized the space program – "using technological means for political ends," as Wiesner put it – PSAC's scientific arguments became irrelevant because scientific achievements were not the main goal. Although Wiesner and PSAC remained opposed to a manned lunar landing, the science adviser understood Kennedy's motivation behind a bigger space program and accepted his declining influence on the issue.

[41] McDougall, *The Heavens and the Earth*, 315.

[42] Logsdon, *The Decision to Go to the Moon*, 20, 118; Logsdon, *John F. Kennedy and the Race to the Moon*, 90, 99; Wang, *In Sputnik's Shadow*, 221.

[43] Jerome B. Wiesner, "Science and Technology: Government and Politics," *Technology in Society* 2, no. 1-2 (1980): 35; Wiesner, "Kennedy," 284.

[44] Wiesner to Kennedy, "Memorandum for the President," Feb. 20, 1961, National Security Files (digital identifier: JFKNSF-307-003-p0015), JFKPL; Kalic, *US Presidents and the Militarization of Space*, 76; Logsdon, *John F. Kennedy and the Race to the Moon*, 90.

Wiesner's political sensitivity undoubtedly contributed to Kennedy and Wiesner remaining on good terms despite the science adviser's dissent on the new plans for space. Once Kennedy decided to put a man on the moon, Wiesner went along with it. Although he avoided commenting on space when asked to give speeches or other public statements, he defended Kennedy's decision when necessary: responding to critique, he stated that the space program represented "the best judgment of Administration officials, Congress, and leading scientists and engineers," and emphasized the importance of improving American prestige.[45] Furthermore, Kennedy appreciated Wiesner and PSAC often took an opposing standpoint on space, arguing that it enabled him to see issues from different perspectives.[46] "President Kennedy once told a reporter that the most important thing I did for him," Wiesner recalled, "was to keep the government from going all one way." Kennedy thus allowed PSAC to continue advising on the Apollo program, and although he often did not end up following their advice, Wiesner commented that Kennedy "enjoyed the give and take."[47] Overall, Wiesner described his relationship with the President as "intimate" and "confidential", and other members of PSAC confirmed that their relationship with the President was just as good as it had been under Eisenhower.[48] Kennedy thought the same way, writing that he saw Wiesner as "a good friend and trusted advisor … one of those rare individuals … who can work effectively to relate the complexities and the opportunities of science to the needs of a

[45] Wang, *In Sputnik's Shadow*, 221; Jerome B. Wiesner, *Where Science and Politics Meet* (New York: McGraw-Hill, 1964), v; Response to article from *Science* by John Troan, April 19, 1963, Office Files (digital identifier: JFKPOF-067-017-p0031), JFKPL.

[46] William G. Wells, "Science Advice and the Presidency: An Overview from Roosevelt to Ford." *Technology in Society* 2, no. 1-2 (1980): 191-220; Wiesner, "Science and Technology: Government and Politics," 35; Wang, *In Sputnik's Shadow*, 223, 233-34.

[47] Wiesner, "Science and Technology: Government and Politics," 33-34; Wiesner, *Where Science and Politics Meet*, 45.

[48] Jerome B. Wiesner, "The Rise and Fall of the President's Science Advisory Committee," in *Jerry Wiesner,* 411; Killian, *Sputnik, Scientists, and Eisenhower,* xv; Lee A. DuBridge, "Science Advice to the President: Important and Difficult," *Technology in Society* 2, no. 1-2 (1980): 11.

nation."[49] Wiesner's understanding of his political environment on the one hand and Kennedy's appreciation for PSAC's opposition, on the other hand, strengthened by their good relationship, thus ensured that the committee was able to continue its advising on space.

Despite Kennedy's politicization of the space program, PSAC continued to advocate for the same issues as it had before. With Kennedy's approval to continue advising on space, PSAC's kept its influential position in the White House and did not stand defeated after the acceleration of the Apollo program. To keep its advice relevant, PSAC stayed within the framework of the program: the committee still closely evaluated NASA's work, but now specifically focused on how the agency planned the manned moon landing. It also focused on the possibilities of scientific research within the Apollo program. Furthermore, Wiesner continued to promote international cooperation when criticism arose over NASA's expenses. Kennedy always listened to the committee's advice, but the President's response varied strongly depending on his political needs.

PSAC's evaluation of NASA's work resulted in a big debate over the best way to get to the moon. NASA favored the "Lunar Orbit Rendezvous" (LOR): a big rocket would bring the astronauts in an orbit around the moon, from where a module would decouple to land on the surface. Afterward, the module would go back into lunar orbit, couple with the original rocket, and fly back to earth. PSAC, on the other hand, favored the "Earth Orbit Rendezvous" (EOR): two rockets would launch separately, couple while orbiting the earth, and then fly to the moon where it would land directly on the surface.[50] NASA believed that the lunar landing could be made five months sooner using LOR compared to EOR. PSAC preferred EOR because it was cheaper and because it promised beneficial for scientific research. Firstly, the method would allow for more payload, which meant more scientific equipment could be

[49] John F. Kennedy, letter to Arthur B. Krim, Dec. 1, 1961, in *Jerry Wiesner,* 527;

[50] Courtney G. Brooks, James M. Grimwood, and Loyd S. Swenson, Jr., *Chariots for Apollo: A History of Manned Lunar Spacecraft* (Washington, D.C.: U.S. Government Printing Office, 1979), 84-85, 100-08.

brought to the moon. Secondly, the technique used with EOR would be useful for future space applications, such as a space station in earth orbit.[51] LOR was, as Walter McDougall describes, "a 'technological dead end' of limited future value to the space program."[52] Wiesner worked hard to make his opinion known: his preference for EOR was stated in many PSAC reports, he wrote to David Bell from the Bureau of Budget to address the extra expense of the LOR method, and he directly informed the president of the benefits EOR would bring.[53] NASA resented PSAC's meddling, but Kennedy again liked to hear the different opinions. When NASA rocket scientist Wernher von Braun explained to Kennedy that LOR was the best method to go to the moon, the President mentioned that his science adviser thought otherwise; he called for Wiesner, and a heated debate between the two scientists ensued. In the end, however, Kennedy did not intervene with NASA's plans. Without active support from the President, PSAC was unable to change NASA's direction, and the agency continued with LOR.[54]

Apart from the LOR-EOR debate, PSAC also tried to safeguard scientific research in other ways, but without much success. The committee issued a report stating that NASA was growing rapidly due to the Apollo program, but that universities' output of PhD scientists and engineers remained the same. This would mean that the agency would soon absorb most of the technological manpower available, to the disadvantage of other scientific fields. It would

[51] President's Science Advisory Committee, "Report of the Space Vehicle Panel," July 26, 19162, Office Files (digital identifier: JFKPOF-086a-004), JFKPL; "Status Report on Activities of the President's Science Advisory Committee and its Staff," June 11, 1962, OST, reel 64, JFKPL.

[52] McDougall, *The Heavens and the Earth*, 379.

[53] "Status Report on Activities of the President's Science Advisory Committee and its Staff," Dec. 11, 1961, and "Status Report on Activities of the President's Science Advisory Committee and its Staff," March 12, 1962, OST, reel 64; Wiesner, "Memorandum for David E. Bell," Nov. 14, 1962, OST, reel 67; Wiesner, "Memorandum for the President," Nov. 16, 1962, Office Files (digital identifier: JFKPOF-067-016-p0065), all from JFKPL.

[54] Roger E. Bilstein, *Stages to Saturn: A Technological History of the Apollo/Saturn Launch Vehicles* (Washington, D.C.: U.S. Government Printing Office, 1980), 67-68; McDougall, *The Heavens and the Earth*, 379; John M. Logsdon, *John F. Kennedy and the Race to the Moon*, 144.

also mean that fewer scientists would stay at universities to teach, making it harder to ensure even the current output of PhDs. PSAC thus advocated for increased funding for science education.[55] Furthermore, PSAC pushed for more scientific research within NASA. The committee argued that "past U.S. successes in space science are responsible for a good deal of the prestige the U.S. now has in space," but that NASA was neglecting these areas in favor of the manned missions.[56] Within the Apollo program, too, PSAC called for more scientific research, such as unmanned flights to inspect the surface of the moon to ensure the astronauts' safe landing.[57] PSAC was lucky to have the support of NASA administrator James Webb, who also called for "a balanced space program in which adequate resources are invested in research."[58] Here too, however, PSAC did not find Kennedy's support – on the contrary, Kennedy disliked Wiesner and Webb's suggestion of a balanced space program that also focused on science. When the three met in the White House, Kennedy told them: "everything that we do ought to really be tied into getting on the moon ahead of the Russians." When Webb asked why the program couldn't be focused on general preeminence in space, the President replied:

> Because, by God, we've been telling everyone we've been preeminent in space for five years and nobody believes us … the policy ought to be that this is the top priority program of the agency … otherwise we shouldn't be spending this kind of money because I'm not that interested in space … we're talking about fantastic expenditures which wreck our budget and all these other domestic programs and the only justification for it, in my opinion, is to do it because we hope to beat them and demonstrate that starting behind as we did by a couple of years, by God, we passed 'em.[59]

This shows that Kennedy's only concern at this point regarding space policy was getting to the moon as fast as possible and that he was not open to suggestions deviating from that goal. The only value the Apollo program had to Kennedy was its direct pay-off in terms of American prestige. His evaluation of space policy in political terms was not new to PSAC; Eisenhower had done so too. The difference was that Eisenhower aimed for US supremacy in space, science, and overall economy in the long term, which left room for PSAC to propose scientific projects without an immediate pay-off. Kennedy, on the other hand, tied US supremacy to the manned lunar landing happening as soon as possible, which left no room for PSAC's ideas on science unless it contributed to executing the Apollo program as fast as possible. Kennedy was willing to let the LOR-EOR debate happen between PSAC and NASA, as it directly concerned how astronauts would reach the moon, but did not want to hear about extra investments on scientific research. Despite Wiesner and PSAC's efforts to make their ideas known, the committee's position was marginalized: its ideas on science were not welcomed by the President, and its ideas directly related to the execution of the Apollo program were overruled by NASA.

Wiesner successfully put forward the idea of cooperation in space, however, because the idea was politically relevant to the President. Kennedy had liked the idea of cooperation since the beginning of his presidency, and so Wiesner had asked a PSAC panel to prepare a report on possible space programs in which the U.S. could cooperate with the Soviet Union.[60] Wiesner continuously promoted the option, and in 1963 the idea caught on with the President.

[55] Report "technology and economic prosperity", Dec. 3, 1962, Office Files (digital identifier: JFKPOF-072a-004-p0004), JFKPL; Robert N. Kreidler, "Memorandum for Members of the President's Science Advisory Committee," Nov. 15, 1961, OST, reel 64, JFKPL.

[56] "Status Report on Activities of the President's Science Advisory Committee and its Staff," April 2, 1962 and "Status Report on Activities of the President's Science Advisory Committee and its Staff," May 7, 1963, OST, reel 64, JFKPL.

[57] Wiesner, "Memorandum for the President," Aug. 2, 1962, Office Files (digital identifier: JFKPOF-085-011), JFKPL.

[58] Appendix to letter from James E. Webb to Vice President Johnson, May 10, 1963, JFK's Office Files part 2, reel 9, RIAS.

[59] White House tapes, conversation between President Kennedy, James Webb, and Jerome Wiesner, Nov. 21, 1962, Presidential Recordings: Digital Edition, Miller Center, University of Virginia.

[60] Eugene Skolnikoff, "Memorandum for Special Assistant to the President for Science and Technology," May 25, 1961, OST, reel 46, JFKPL.

At that time, criticism was rising on the Apollo program. Scientists were speaking out against the uselessness of the program and advocated for an unmanned lunar landing, which would – scientifically speaking – be just as useful; Congressmen, too, started to doubt if the program was worth the money.[61] The New York Times reported that "there is widespread and growing Congressional misgiving over the management of the space program and the emphasis being placed on the manned lunar landing." Senator J. W. Fulbright said that he could not believe "that landing an American on the moon represents the most urgent need, the most compelling challenge, or the most promising opportunity before the American people in this decade." Congress threatened to cut funding for the program, which would likely make it impossible for Kennedy to achieve his goal of landing a man on the moon before the end of the decade.[62] The President was sensitive to these criticisms, and cooperation on the manned lunar landing seemed an easy way out. "If we cooperate, the pressure comes off," national security adviser McGeorge Bundy told the President, "and we can easily argue that it was our crash effort on '61 and '62 which made the Soviets ready to cooperate."[63] At the United Nations General Assembly in September 1963, Kennedy proposed to work together with the Soviet Union in space.[64] Dryden acknowledged that the idea of cooperation was likely to derive from Wiesner because he proposed it so often.[65] Wiesner's skills as a science adviser play a major role in successfully addressing international cooperation, as he understood the President's needs and how to bring his advice to the forefront. Ultimately, however, the reason that Wiesner's idea

[61] Letter from Vannevar Bush to James Webb, April 11, 1963, JFK's Office Files part 2, reel 9, Roosevelt Institute; Response to article from *Science* by John Troan, April 19, 1963, Office Files (digital identifier: JFKPOF-067-017-p0031), JFKPL.

[62] "Space Funds Face 700 Million Cut," *NYT*, Sept. 19, 1963, p. 9; "Racing to the Moon: Fulbright Arguments Against Program Expected to Strengthen Opposition", *NYT*, Oct. 20, 1963, p. 189.

[63] McGeorge Bundy, "Memorandum for the President," Sept. 18, 1963, JFK's Office Files part 2, reel 9, RIAS; John M. Logsdon, "John F. Kennedy's Space Legacy and Its Lessons for Today," *Issues in Science and Technology* 27, no. 3 (2011): 29.

[64] "Kennedy Asks Joint Moon Flight by U.S. and Soviet as Peace Step," *NYT*, Sept. 21, 1963, p. 1.

[65] Dryden, Oral History Interview.

of international cooperation was taken into consideration and his proposals on scientific research in space were not was their political relevance to the President. To Kennedy, the idea of international cooperation was relevant because it could help avoid him losing face, whereas scientific research had no added value to him. Unfortunately for Wiesner, Khrushchev did not react to Kennedy's proposal to cooperate. He only commented that "at the present time we do not plan flights of cosmonauts to the moon. I have read a report that the Americans wish to land a man on the moon by 1970. Well, let's wish them success."[66] Less than a month later President Kennedy was assassinated, and the idea of cooperation in space with the Soviet Union was never seriously considered again.

Although much changed for PSAC during the Kennedy presidency, the committee's influence was determined by the same three factors as it was under Eisenhower: political relevance, political tact, and Kennedy's receptiveness towards advice. Under Kennedy, PSAC continued to promote a balanced space program centered around scientific research and advised against a space race, which caught on with the new President at first. The message was relevant to Kennedy, as it aligned with his personal views; Wiesner understood the politics around space, addressing Kennedy's concern about prestige; also, Kennedy was very willing to listen to Wiesner's advice, having known the scientist for a long time. With Kennedy's decision to accelerate the Apollo program PSAC's influence declined: the President's priority of increasing prestige did not align with PSAC's focus on scientific research, making most of the committee's advice politically irrelevant. Despite being one of the very few critics of the accelerated Apollo program in the White House, PSAC was able to continue advising on space. This was both due to Kennedy's continued openness towards the committee's ideas, as well as Wiesner's skills as a science adviser, as he understood the President's needs and used his connections to further PSAC's advice. PSAC kept promoting

[66] "Soviet Bars Race with U.S. to Land Men on the Moon," *NYT*, Oct. 27, 1963, p. 1.

its original standpoints, only now tailored to the Apollo program; the effectiveness of their advice varied, however, depending on Kennedy's political needs. He cared little about how exactly to get to the moon and did not interfere in the LOR-EOR debate, but he strongly declined proposals for scientific research because it diverged from his goal of prestige. After widespread critique on the rising costs, Kennedy immediately picked up on Wiesner's idea of international cooperation because it offered a politically viable way out of the Apollo program. Overall, PSAC's position during the Kennedy presidency was good but complicated. The committee enjoyed a high position in the White House and direct access to the President, but rather than the steady influence the committee enjoyed under Eisenhower, the impact of PSAC's advice fluctuated depending on its political relevance.

CHAPTER FOUR

Johnson and the Decline of Science Advising

The assassination of Kennedy left much uncertain. When Johnson took over the presidency, he prioritized taking away this uncertainty by showing his support and continuation of the former President's work. Many important figures who were part of the Kennedy administration disliked Johnson, yet the new President persuaded them to stay. Remarkably, as Robert Caro notes, the Kennedy administration thus remained almost fully intact after Johnson came into the White House.[1] Johnson used his vast experience with Congress to ensure that bills prepared by the Kennedy administration would be accepted. Kennedy's ambitious goal in space would be continued, too, Johnson announced in his first State of the Union a couple of weeks after his inauguration. "We must assure our pre-eminence in the peaceful exploration of outer space," Johnson said, "focusing on an expedition to the moon in this decade."[2] Despite the financial troubles this goal brought, with Congress constantly wanting to cut funds and NASA wanting to increase them, in the following years of his presidency Johnson saw to it that the Apollo program would become a success.[3]

This chapter analyzes PSAC's role regarding the continued Apollo program and the post-Apollo space program and argues that its influence strongly declined, not only because the PSAC's advice remained politically irrelevant but also because the committee did not have the close ties it had with Eisenhower and Kennedy. First, this chapter assesses the three

[1] Robert A. Caro, *The Years of Lyndon Johnson. Vol. 4: The Passage of Power* (New York, NY: Knopf, 2012), 409-14.

[2] Record of Lyndon B. Johnson's State of the Union, Jan. 8 1964, Presidential Speeches, Miller Center, University of Virginia, https://millercenter.org/the-presidency/presidential-speeches/january-8-1964-state-union.

[3] Robert Dallek, *Flawed Giant: Lyndon Johnson and His Times, 1961-1973* (New York: Oxford University Press, 1998), 418-25.

factors used in previous chapters determining the impact of science advice at the start of Johnson's presidency – first Johnson's receptiveness of advice, then the new science adviser's political tact, and lastly the political relevance of PSAC's advice. As none of these three criteria were met, the committee's advice had very little impact. This chapter then shows PSAC's response to its declining position in the White House, in which the committee tried to remain objective and critical on the one hand, while trying to increase its relevance for the Johnson administration on the other hand. The chapter ends with the Vietnam War further deteriorating the relationship between PSAC's scientists and Johnson, and later President Nixon as well, ultimately leading to the abolishment of the committee.

To understand Johnson's views on space and his relationship with NASA and PSAC, it is useful to look back at his years as a senator and vice president. When Johnson became president, he was not merely inheriting Kennedy's space program – he had been strongly involved in shaping space policy since the launch of Sputnik in 1957. As a senator, Johnson used Sputnik as an opportunity to criticize the Eisenhower government and became, as Robert Dallek puts it, the Senate's "space czar" who continuously argued for an all-out effort to beat the Soviets in space.[4] He led Congressional hearings on the American backlog in space, which he proclaimed was "perhaps the greatest [threat] our country has ever known," set up and chaired the Special Committee on Space and Astronautics, and co-sponsored bills on the creation of NASA.[5] His involvement in space continued during Johnson's years as Vice-President. Kennedy appointed Johnson as chairman of the National Space Council, a position previously held by the president, making Johnson responsible for reviewing NASA's work. Johnson also convinced Kennedy to appoint his friend James Webb as the administrator of

[4] Robert Dallek, "Johnson, Project Apollo, and the Politics of Space Program Planning," in *Spaceflight and the Myth of Presidential Leadership*, ed. by Roger D. Launius and Howard E. McCurdy (Urbana, IL: University of Illinois Press, 1997), 70.

[5] "Excerpts From the Comments of Senator Johnson, Dr. Teller and Dr. Bush," *NYT*, Nov 26, 1957, p. 20; Robert Dallek, *Lyndon B. Johnson, Portrait of a President* (New York: Oxford University Press, 2004), 110.

NASA, with whom he frequently discussed space issues.[6] As shown in the previous chapter, Johnson was a big advocate of the manned moon landing Kennedy was considering, persuading the President that "more resources and more effort need to be put in our space program as soon as possible."[7] As a president, Johnson's support of the space program was therefore not only a show of continuity with the Kennedy presidency but also something he had lobbied for since 1957.

Despite the continuation in space policy, Johnson's move to the Oval Office ushered in significant change for the scientists in PSAC. First of all, their relationship with the President changed, and with that the President's receptiveness to scientific advice, too. Contrary to Eisenhower and Kennedy, Johnson did not have a close connection with PSAC's members. This had already become clear when, as vice president, Johnson had to help Kennedy in his decision to go to the moon: in all the briefings on the topic and when drawing up his recommendations to Kennedy, he did not once involve science adviser Jerome Wiesner.[8] Once Johnson became president, the lack of attention to the position of science adviser continued. Johnson did not have a candidate for the position in mind, which says something about the extent to which he cared about the position. Coincidentally, Kennedy had appointed a new science adviser just a week before his assassination: Donald Hornig, a 43-year-old chemistry professor from Princeton who had worked on the Manhattan project and had led PSAC's Man-in-Space panel that estimated the costs of a manned moon landing for the Eisenhower administration. In line with his goal to stress continuity, Johnson decided to appoint Hornig as the new science adviser. Whereas the previous two presidents had chosen a

[6] Randall B. Woods, *LBJ: Architect of American Ambition* (Cambridge, MA: Harvard University Press, 2007), 335-37, 397.

[7] Johnson to Kennedy, Apr. 28, 1961, John F. Kennedy's Office Files part 1, reel 3, RIAS.

[8] John M. Logsdon, *John F. Kennedy and the Race to the Moon* (New York, NY: Palgrave Macmillan, 2011), 90-91, 99.

science adviser they knew and trusted, Johnson had not met his science adviser until he was formally appointed.[9]

The change in the relationship PSAC had with the President was not just due to a lack of acquaintance. As Zuoyue Wang describes, there was a "mismatch between the populist Johnson and his science advisers from the Ivy League."[10] On the one hand, Johnson was not receptive to PSAC's advice – unlike Eisenhower and Kennedy, who had been open to science advice and took PSAC's input into serious consideration. W. Henry Lambright describes Johnson as "highly pragmatic and concerned with visible 'payoffs' in the short term," which did not match the apolitical, long-term thinking that had made PSAC so popular with Eisenhower.[11] Neither did the new President "have the same kind of personal interest in science or intellectual curiosity as Kennedy," Walter McDougall points out.[12] Under Kennedy, PSAC had already experienced that scientific advice was not always of use when decisions were made on purely political grounds, but they always had a seat at the table because Kennedy valued their point of view. Johnson, however, entered the office with a clear agenda in mind and was not looking to discuss this with PSAC's scientists. Barely two months into Hornig's function as presidential science adviser, Johnson angrily told one of his aides that Hornig should "quit writing notes … when I want an opinion from him, I'll ask for it."[13] Johnson, however, rarely asked Hornig for advice and ignored his science adviser on

[9] Recording of Lyndon Johnson and Albert Thomas, Dec. 5, 1963, Presidential recordings digital edition, Miller Center, University of Virginia; W. Henry Lambright, *Presidential Management of Science and Technology: The Johnson Presidency* (Austin: University of Texas Press, 1985), 14.

[10] Zuoyue Wang, *In Sputnik's Shadow: The President's Science Advisory Committee and Cold War America* (New Brunswick, NJ: Rutgers University Press, 2008), 238.

[11] Lambright, *Presidential Management*, 12.

[12] Walter A. McDougall, *The Heavens and the Earth: A Political History of the Space Age* (New York: Basic Books, 1986), 398.

[13] Recording of Lyndon Johnson and Myer Feldman, March 13, 1964, Presidential recordings digital edition, Miller Center, University of Virginia.

many big issues relating to science.[14] He also took away PSAC's privileges of attending NSC meetings and accessing science-related government plans.[15] The regular and informal access to the Oval Office that PSAC had enjoyed since its establishment thus ended when Johnson became president.

Next to Johnson's lack of interest in the committee, Hornig had difficulties maneuvering in the political White House environment, adding to PSAC's inability to get through to the President. Whereas previous science advisers "were in the inner circles of their respective Presidents and were essentially on a peer basis with senior White House aides," William Wells writes, Hornig was a "nice guy" who "accepted a secondary role."[16] Whereas Kennedy's adviser Wiesner, for example, had worked together with NASA administrator James Webb and Bureau of Budget director David Bell to spread PSAC's ideas, Hornig was less apt in making the scientific voice heard in the White House. Also, whereas previous advisers understood and framed advice to fit their president's point of view, Hornig wrote that he had "little feeling for [Johnson's] strong, dominant personality who saw everything in political terms."[17] Although Hornig was an excellent scientist, he lacked the political skills to further PSAC's ideas.

Not only PSAC's position in the White House but also the content of the committee's work shifted under Johnson. Since the launch of Sputnik, the development of science and technology had been a goal in and of itself. Lambright argues that this "technoscience surge" ended under Johnson: the President's plans for the Great Society meant that the development of science and technology was no longer a goal on its own, but rather took on a supportive

[14] William G. Wells, "Science Advice and the Presidency: An Overview from Roosevelt to Ford," *Technology in Society* 2, no. 1-2 (1980): 206.

[15] Wang, *In Sputnik's Shadow*, 239.

[16] Wells, "Science Advice and the Presidency," 203, 205.

[17] Donald Hornig, "The President's Need for Science Advise: Past and Future," in *Technology in Society* 2, no. 1-2 (1980): 47.

role as a tool to end poverty.[18] Whereas PSAC previously studied mostly military matters, topics shifted to world food supplies or environmental issues.[19] In Johnson's eyes, science and technology had little value on their own – rather, they were a tool to gain political leverage. When trying to get the Civil Rights Bill to pass, for example, Johnson ensured the support of the Republican House minority leader Charles Halleck by allocating large NASA research programs to his district.[20] Similarly, Johnson used science as a tool in foreign relations: two times, for his meeting with the Prime Minister of Japan and with the President of South Korea, Johnson was unsatisfied with what he could offer the foreign leaders and called Hornig for ideas – ultimately leading to extensive science research collaboration programs with the two countries.[21] The end of the technoscience surge and Johnson's focus on political leverage meant that science and technology had to prove their political usefulness and were no longer automatically a priority in the White House, as they had been under Eisenhower and Kennedy.

The three factors that determined PSAC's influence on space policy – political relevance, the science adviser's tact, and the president's receptiveness – thus all declined from the start of the Johnson administration. What did this mean for PSAC's position in the White House? Now that science advice had moved to the back of the agenda for both personal and political reasons, PSAC's status declined as well. Hornig admitted that he was "never a part of, or even near to, the inner circle."[22] William Wells writes that although Wiesner had represented Kennedy's thoughts on many science-related topics, Hornig did never "speak for

[18] Lambright, *Presidential Management*, 7-9.

[19] "Presidential Science Advisers, Marking a Decade of Influence, Are Turning to Nonmilitary Matters," *NYT,* Feb. 20, 1968, p. 23.

[20] Caro, *The Passage of Power*, 559-60.

[21] Donald Hornig, "Science Advice in the Johnson White House," in *Presidential Science Advisors: Perspectives and Reflections on Science, Policy and Politics*, ed. by Roger A. Pielke and Roberta A. Klein (Dordrecht: Springer, 2010), 19-27; Hornig, "The President's Need for Science Advise," 49.

[22] Hornig, "The President's Need for Science Advise," 47.

Johnson."[23] Especially on matters regarding space Johnson rather turned to NASA administrator James Webb, whom he had known and worked with for over fifteen years.[24] If PSAC wanted to obtain the President's attention it would have to push its ideas, but this posed a big challenge for the committee: first because Hornig had little experience in Washington and lacked connections to get to the President, and second because advocacy could harm the objective image that PSAC had prioritized since its establishment. PSAC thus had to try to improve its standing in the White House on the one hand, while protecting its objectiveness on the other.

For a large part, PSAC tried to maintain its critical, scientific outlook on space policy, but its critique had little effect. When the DOD developed an elaborate plan for a space laboratory, PSAC advised to instead start with launching simple capsules and to gradually improve the laboratory from there. NASA and President Johnson quickly sided with the DOD, and Hornig was forced to go along with the plan, with little of his critique being considered by the other parties.[25] In 1967, the three astronauts that were supposed to be on Apollo 1 died in a fire that erupted during a test launch. PSAC wanted to investigate what NASA could have done to prevent the accident, but Webb successfully held the investigation off.[26] PSAC's lack of influence again became clear when Webb resigned in October 1968. The administrator was frustrated by the declining funding for NASA and told the press that the budget cuts could result in the US losing its advantage over the Soviet Union in space.[27] Hornig was quick to inform the President that Webb's statement was untrue as the Soviet

[23] Wells, "Science Advice and the Presidency," 204.

[24] Caro, *The Years of Lyndon Johnson*, 560.

[25] Arnold S. Levine, *Managing NASA in the Apollo Era* (Washington, D.C.: U.S. Government Printing Office, 1982), 233-35.

[26] "3 Apollo Astronauts Die in Fire, Grissom, White, Chauffee Caught in Capsule During Fire," *NYT*, Jan. 28, 1967, p. 1; Wang, *In Sputnik's Shadow,* 249.

[27] "NASA, on 10th Birthday, Faces Uncertain Future," *NYT*, Oct. 1, 1968, p. 2.

Union was still far behind. Johnson, annoyed by Hornig's lack of political sensitivity, told his science adviser to "drop it!" and warned that under unforeseen circumstances the Soviet Union might still catch up, in which case PSAC would look untrustworthy.[28] The incidents above show that PSAC's critique was not welcomed. Although the previous chapters have shown that it had always been difficult for the committee to go against such a large agency as NASA, even during the Eisenhower presidency, Johnson and Webb's alliance made it nearly impossible for PSAC to get their voice heard.

Perhaps because of PSAC's continued frustration in failing to change NASA's course, in 1967 the committee changed its stance on the Apollo program to boost its image and influence. Although PSAC had been wary of manned programs since the very beginning, the committee seemed to accept the inevitability of the manned lunar landing and embraced it as an opportunity to promote scientific research within the administration as well as with the larger public.[29] Two members of PSAC, for example, developed a special camera for the astronauts to take close-up pictures of the lunar surface, which geologists could study.[30] The committee also published a report on future space programs, called *The Space Program in the Post-Apollo Period*, which was – unlike earlier reports – mostly in line with the recommendations of NASA's advisory board. The report called for many more future space programs to be carried out, including manned and unmanned lunar explorations, probes to Venus and Mars, and a space laboratory circling the earth. Although the report was still heavily focused on scientific research, as the committee's first report *Introduction to Outer*

[28] Dallek, *Flawed Giant*, 422-23.

[29] Wang, *In Sputnik's Shadow*, 250-51.

[30] Thomas Gold, "Apollo 11 and 12 Close-up Photography," Icarus 12, no. 3 (1970): 360.

Space had been, recommendations like planning one to two manned lunar landings *per year* showed that PSAC went from man-in-space skeptic to man-in-space enthusiast.[31]

PSAC's changing stance on manned programs is important because it was a political move intended to gain a better position in the administration: a reaction to the politicization of space that began when Kennedy decided to accelerate the Apollo program on the grounds of prestige. From then on, PSAC's influence declined because the committee's scientific outlook on space became less relevant to the president. With Hornig's second-rate position in the White House and Johnson's unwillingness to ask PSAC for advice, the committee found itself unable to influence space policy advocating for the same issues since its establishment a decade earlier. Siding with NASA on the post-Apollo program was an attempt to stay relevant in the administration: instead of being an outlier, the committee could promote its program together with NASA, both strengthening Hornig's position in the White House and potentially making Johnson more receptive towards the scientists' ideas.

Unfortunately for PSAC, by this time Johnson was fully occupied with the worsening Vietnam War, which led to large cuts in NASA's budget and worsened the scientists' relationship with the President. Although Johnson was reluctant to decrease the space agency's budget, having advocated for a large space program for so many years, he was forced by the large war expenditures and pressure from Congress. Although NASA warned that decreased funding would make a safe moon landing within the decade impossible, Johnson saw the budget cuts as an opportunity to point to Congress if the Apollo program were to fail.[32] NASA's budget declined from $5.9 billion in 1966 to $3.8 billion in 1966, and the agency announced that it would need to cut one-fifth of its workforce.[33] Although the

[31] President's Science Advisory Committee, *The Space Program in the Post-Apollo Period* (Washington: U.S. Government Printing Office, 1967); Wang, *In Sputnik's Shadow*, 249-50.

[32] Dallek, *Flawed Giant*, 420-22.

[33] "NASA, on 10th Birthday, Faces Uncertain Future," *NYT*, Oct. 1, 1968, p. 2.

agency was able to finish the Apollo program with the available budget, it became clear that NASA would not carry out any of the large programs that it had envisioned post-Apollo.[34] Space exploration thus hit a dead end and left PSAC unable to promote scientific research in outer space. Furthermore, many scientists strongly disagreed with Johnson over the Vietnam War, causing the relationship between the President and the committee to worsen.[35] Hornig explained that "there was a continuing erosion of confidence in the political loyalty of our office" causing "a gradual erosion in respect to everything else we did."[36] PSAC's position in the White House further declined: whereas in early 1965 one of Johnson's White House aides reminded Hornig that he was "always and automatically invited" to Cabinet meetings, he was not present at any of the meetings in 1966.[37]

This sentiment was carried over when Richard Nixon became president in 1969. Despite the manned moon landing was carried out successfully that summer, Nixon rejected new projects proposed by NASA. As Roger Handberg writes, "The Nixon administration was uninterested in space policy per se once the glamour or historical significance of the *Eagle* lunar landing was past."[38] This did not mean that PSAC could go back to promoting scientific space endeavors. Nixon's science adviser, former Caltech president Lee DuBridge, hardly spoke to the President directly and had to deal with his staff instead.[39] Wells remarks that DuBridge, like Hornig, "lacked a certain inner toughness" that was required in the Nixon White House leaving him unable to get PSAC's ideas across.[40] On top of that, Nixon strongly

[34] "Space Programs Sharply Reduced," *NYT*, Jan. 30, 1968, p. 16; Dallek, *Flawed Giant*, 420-22.

[35] Wells, "Science Advice and the Presidency," 206-07.

[36] Hornig, "Science Advice in the Johnson White House," 27; Hornig, "The President's Need for Science Advise," 47.

[37] Letter from Horace Busby to Donald Hornig, May 12, 1965, and attendance lists of Cabinet Meetings 1965-1966, from Lyndon B. Johnson's Cabinet Meetings, reel 1-3, RIAS.

[38] Roger Handberg, "Human Spaceflight and Presidential Agendas: Niche Policies and NASA, Opportunity and Failure," Technology in Society 39 (2014): 41.

[39] Hornig, "The President's Need for Science Advise," 51.

[40] Wells, "Science Advice and the Presidency," 208.

disliked the scientists: Wiesner wrote that the President "didn't trust many people, and was particularly mistrustful of scientists who were, in his view, all liberal and against him."[41] To Nixon, his suspicion was confirmed when some PSAC members – frustrated by the lack of presidential attention – made public remarks of their disagreement with the administration. PSAC lost its status as an objective committee and came to represent the larger academic opposition to the war. Shortly after his re-election, Nixon abolished PSAC and the position of Presidential Science Advisor.[42] The politically opposing views, the lack of political tact from both DuBridge and other PSAC members, and Nixon's distrust towards the scientists led to the end of presidential science advising.

Although space policy remained the same when Johnson took over the presidential office, a lot changed for PSAC. The committee had grown used to its ideas declining in relevance since Kennedy's decision to accelerate the Apollo program, but Kennedy still considered their advice – both because Wiesner was able to get PSAC's ideas to the President and because the President was willing to listen. Both of these factors changed under the Johnson administration. Hornig's lack of acquaintance with Johnson and his inexperience in the highly political environment of the White House meant that PSAC lost its position in the inner circle. Johnson, on his part, was not very welcoming of advice that was not based on political considerations and rarely asked Hornig for his opinion – especially regarding issues on space, because Johnson would rather talk to Webb. All three factors necessary for effective science advising were missing. PSAC remained active in evaluating and criticizing NASA's work, but without success.

The scientists realized that their diminishing role was due to a lack of political compatibility with Johnson, and that to increase influence PSAC had to respond in a political

[41] Jerome B. Wiesner, "Science and Technology: Government and Politics," *Technology in Society* 2, no. 1-2 (1980): 34.

[42] Wells, "Science Advice and the Presidency," 210.

manner. The result was a pragmatic turnaround on the Apollo program and full support of NASA's future endeavors. With NASA on its side, PSAC might have gotten more power in the White House. Unfortunately, the Vietnam War negatively impacted both the political relevance of space policy and PSAC's relationship with the President. Despite Johnson's enthusiasm for space he was forced to approve drastic cuts in NASA's budget. The opposition of PSAC's members to the war made Johnson even less receptive to the committee's advice, whose loyalty he had questioned from the beginning. Nixon's shared this distrust, ultimately leading to the end of science advising. Although the Vietnam War was an important factor in the abolishment of PSAC, it was a catalyst rather than the main cause: it enlarged the distrust and political mismatch that had been present from the beginning of Johnson's presidency. Even without the war, it would have been extremely difficult for PSAC to turn around its declining status. The Johnson years show a president unwelcoming of science advice and a committee struggling to adjust to a political environment, which left PSAC with no power to impact space policy.

CONCLUSION

Nixon made an end to PSAC, but luckily for the scientific community, Gerald Ford appointed a new science adviser three years later. The president has had a science adviser ever since. Never again, however, would so many high-standing scientists work so closely with the president as PSAC did under Eisenhower and Kennedy, and to some extent under Johnson. The reason for PSAC's influence on such an important topic as space policy, and the reasons behind the decline in that influence, provide insight into what scientists can do for the government, but also how the government affects science.

This thesis argues that three factors determined the extent of influence PSAC had on space policy: the political relevance of the committee's advice, the science adviser's political tact, and the president's receptiveness to science advice. Advice was politically relevant when it served the president's agenda at the time – a factor that differed per president but could also change within an administration. The science adviser's political tact was determined by his understanding of the president's needs and ability to frame science advice to fit those needs, as well as his experience with and connections within the White House environment to further PSAC's ideas. The president was receptive to advice when he was willing to listen to, or frequently asked for, PSAC's opinion regardless of its political usefulness. From the establishment of PSAC in 1957 to the end of Johnson's presidency in 1969 these three factors strongly varied, impacting PSAC's influence on space policy.

Kennedy's decision to accelerate the manned moon program marked a sharp change in the political relevance of PSAC's advice. Under the Eisenhower administration, PSAC's scientific outlook aligned with Eisenhower's reluctancy to get into a space race. The committee's focus on scientific research matched Eisenhower's long-term Cold War strategy aimed at eventual superiority over the Soviet Union, rather than short-term gains in prestige; also, PSAC's wish to balance science in space with other scientific areas on earth matched

Eisenhower's wish not to spend too much on space projects. At the beginning of Kennedy's term, the President lacked a political outlook on space, meaning PSAC was able to push its scientific agenda without going against the President's ideas. Once he decided to accelerate the Apollo program, however, PSAC's ideas mismatched Kennedy's wish for short-term prestige: the committee's proposals centered around scientific research, balance, and international cooperation were unimpressive and lacked immediate results. This mismatch continued under Johnson, who had been an advocate of a prestige-oriented space program since Sputnik. The Vietnam War, however, changed Johnson's stance on space leading to budget cuts and objections to post-Apollo programs; when PSAC decided to support NASA's manned programs, it no longer aligned with Johnson's views and thus did not increase the committee's political relevance.

It is interesting to note that the relevance of PSAC's advice depended on the president's ideas and vision, but also for a large part on outside events. The reason PSAC existed in the first place was that the launch of Sputnik had prompted Eisenhower to come up with a suitable space policy – if it hadn't been for the Soviet satellite, science advising would not have obtained such a prominent place in the White House. Also, it was the failed Bay of Pigs invasion and Yuri Gagarin's flight that prompted Kennedy to make an all-out effort in space. Lastly, the Vietnam War forced Johnson to cut NASA's budget even though he was a space enthusiast. It was change within a presidency, rather than a change of presidents, that impacted PSAC's political relevance the most: Eisenhower had been president for almost five years when he decided he needed personal science advice, Kennedy drastically changed his space policy a few months into his presidency, and NASA disappeared to the back of Johnson's agenda halfway his term. When it comes to PSAC's political relevance it was not necessarily the president but the uncertain political environment of the presidency that determined the committee's influence.

The science adviser's political tact largely depended on his experience with a political environment and connection with the president. Eisenhower knew James Killian before he appointed him as science adviser; Wiesner had provided Kennedy with science advice for years before he moved into the White House. Both thus had easy access to the president and also had a good sense of what their president wanted. They also lobbied behind the scenes and worked with other White House aides to promote PSAC's ideas. Donald Hornig, however, did not have a personal relationship with his president. The Johnson White House was also a highly political environment, for which Hornig did not have the necessary experience and toughness to push PSAC's standpoints to the forefront. Although the political relevance of advice was more important than the science adviser's tact in determining the committee's influence, the adviser could change PSAC's standing to some degree. After Kennedy's Apollo decision, Wiesner kept PSAC in the loop despite the committee's decline in relevance; Hornig's lack of political tact, on the other hand, annoyed Johnson and furthered PSAC's decline.

The president's receptiveness towards science advice depended on the president's vision and management style. Both Eisenhower and Kennedy were open to hearing PSAC's standpoints. Eisenhower's hidden-hand approach of governing gave PSAC a lot of responsibility in shaping space policy, providing the committee with room to put forward their ideas. Kennedy was interested in science, liked a discussion, and preferred to obtain multiple points of view before making a decision, which meant PSAC maintained its position in the White House despite dissenting on the manned space program. Johnson, on the other hand, knew what he wanted and was not looking for a discussion; he also doubted PSAC's allegiance to the administration, as the committee was not appointed by Johnson and did not share his political views. This, in combination with Hornig's inexperience, caused PSAC's relationship with the president to deteriorate and its influence to diminish.

The committee's reaction to its declining influence on space varied. Overall, the committee was aware of its fragile position in the White House, as becomes clear from the committee's effort to remain nonpartisan when the 1960 election approached. Nonetheless, it did not stop the scientists from being critical, especially of NASA's work. When Kennedy decided to accelerate the Apollo program, Wiesner accepted that he could not stop the acceleration of the Apollo program, but remained critical of NASA and made sure that the President remained well aware of PSAC's standpoints. Under Johnson, however, PSAC was hardly able to get its advice through to the President, and in an attempt to gain political relevance the committee eventually decided to support NASA's manned moon programs. Unfortunately for PSAC, this did not increase its influence within the White House.

This thesis only focuses on space policy from 1957 to 1969 and therefore does not paint the full picture of PSAC's role in the White House. The committee provided advice on many other topics, and its influence in those areas might have strongly varied from its influence on space policy. For example, the scope of this thesis did not allow for a detailed analysis of PSAC's fallout with Johnson over the Vietnam War or Nixon's decision to abolish the committee, neither did it show the committee's arms limitation efforts with the Soviet Union under Eisenhower or its impact on Kennedy's environmentalist policies. Kennedy's decision to put a man on the moon, however, resulted in billions of dollars and thousands of American scientists to work on the Apollo program; PSAC's influence on space policy thus says something about scientists ability to influence the government and the government's ability to influence the course of scientific research.

So what does PSAC's influence on space policy mean for the Forman-Kevles debate introduced in the historiography? Forman argues that cooperation between scientists and the state resulted in the funding of scientific research with promising military applications, and therefore took away scientists' power to decide the course of research. Kevles, on the other

hand, argues that cooperation gave scientists more power to decide where funding should go. Whereas Forman and Kevles focus on the use of science for military applications, this thesis looks at science for the enhancement of prestige, but Kennedy's decision to accelerate the Apollo program is similar to the dynamics described by Forman. The acceleration of the Apollo program meant money and scientific manpower was spent on a project that, from the scientists' perspectives, did not advance the scientific field in a meaningful way. Clearly, the President was deciding NASA's course, which PSAC eventually accepted for political reasons. There were instances in which PSAC influenced the president, for example in Eisenhower's choice for NASA and in Kennedy's decision to keep his space policy research-oriented at the beginning of his term, but once prestige became the main objective of space policy PSAC's impact was limited.

In literature regarding the state's use of science for military applications, scholars debated whether PSAC represented the interest of the state or that of the scientific community – but when it comes to space policy and prestige, it is clear that PSAC's advice reflected the standpoints of the scientific community at large. The committee continuously advocated for international cooperation, rather than keeping space research secret, and warned that research in space should not be at the expense of other scientific research areas. The establishment of PSAC ensured that for the first time, the scientific community was represented in the White House. Regardless of PSAC's declining impact on space policy, this was an important step for the scientific community. Kennedy's decision to go to the moon might fit Forman's analysis, but PSAC's continued critique, ideas, and general involvement in space policy also normalized the presence of scientists in the White House. PSAC proved that it was able to influence the president, as was the case with Eisenhower's choice for NASA or Kennedy adapting PSAC's recommendations at the beginning of his term, which supports Kevles' argument that scientists gained political power. Although in the case of the Apollo program

PSAC's advice did not match the president's needs, the science adviser's closeness to the president enabled him to keep PSAC's ideas on the table in case the political situation changed: when critique of the Apollo program arose, Wiesner was there to remind Kennedy of international cooperation in space. This fluctuation in the relevance of PSAC's advice and PSAC's inability at times to influence space policy does not mean scientists drew the short straw in their cooperation with the state; rather, it reflects the give-and-take reality of politics. PSAC's decline in status under Johnson was much worse for the scientists because it deprived them of a position of influence in case the political situation changed in their favor. The politicization of science requires a skilled science adviser who can easily maneuver in a political environment and has a good relationship with the president.

Ironically, the prestige of the moon landing directly benefitted the scientific community. Witnessing how Apollo 11 took off, how the Eagle landed, how Neil Armstrong set a foot on the moon, and how the astronauts safely returned to earth left many inspired to pursue a career in science. The manned moon landing caused a boom for the scientific community that no one on PSAC had foreseen. Just like the state funding basic research, not knowing what useful applications might eventually come out of it, perhaps scientists' cooperation with the state can lead to benefits that scientists themselves cannot predict.

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